



FRIDAY, OCTOBER 12.

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Contributions.

Electric Lighting in the Stampede Tunnel.

STAMPEDE TUNNEL, WASHINGTON TERRITORY, Oct. 1, 1888.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In response to your request, a description of the plan of lighting the Stampede Tunnel is given. This tunnel is the second in length in the United States, being 9,844 ft. long. It is on the Cascade Division of the Northern Pacific, and pierces the main range of the Cascade Mountains at an altitude of 2,800 ft. above tide. It was completed and opened for traffic the latter part of May of the present year, requiring twenty-eight months for its completion from date of contract.

During the period covered by construction, arc lights were used with very good results, but it was decided to adopt the incandescent system for permanent use for the following reasons: As a linear distance rather than an area was to be lighted, the distribution of the greater number of lamps in one line would be much more effective. The gases and smoke from the engine were found to corrode and clog the mechanism of the arc lamps. The strong air-currents through the tunnel would waste the carbons rapidly, or require the use of globes, with consequent loss of light. An economy was secured in attendance and cost of renewals. For these and other reasons it was decided by Mr. H. S. Huson, the principal Assistant Engineer, to adopt this system as being best adapted to the existing conditions.

The plant was furnished by the Northwestern Electric Supply and Construction Co., of Seattle, W. T. It consists of a 300-light new style Edison municipal dynamo, constructed to run at a pressure of 1,200 volts. Self-lubricating bearings reduce the necessary attendance to a minimum. The lamps, 300 in number, are 30 candle-power each. Light iron brackets from the sides support these lamps at intervals of 66 $\frac{2}{3}$ ft. on each side, giving one lamp to every 33 $\frac{1}{3}$ ft.

The lamps are not placed as high as customary, it being quite an object to avoid the smoke accumulating in the crown of the arch.

The plan of wiring is peculiar to the system. Six complete circuits are required which have a common return wire for all. A "pole box," containing a switch and safety catch, connects each circuit with the common return. This arrangement permits any one or all sections to be lighted at will, for convenience of workmen or trains. The tunnel in general is free from leaks, but where they occur Clark's triple insulated wire is used.

The system is operated from the "east end," and is driven by a double 13 $\frac{1}{2}$ -in. Leffel mining wheel. The falls of Mosquito Creek, almost directly over the east portal, furnish a hydraulic head of 160 ft., with but 400 ft. of piping.

During the dry season the power is furnished by the steam plant, consisting of a 50 h. p. high speed Ball engine and a 60 h. p. steel boiler. The dynamo is arranged to connect with either the engine or wheel, or with both, the engine being used as an auxiliary in the latter case.

Water is furnished from the turbine supply pipe to a 6-in. pipe, laid throughout the length of the tunnel. This pipe was used during construction to furnish compressed air to the rock drills, but is now used as a fire protection. Hydrant cocks are provided at suitable intervals and hose distributed at several points. In the event of a fire breaking out in the timber lining or approach snow-sheds, one or more streams, under a constant pressure of 71 lbs., can be quickly applied at any point. In addition to the above precautions, a complete telephone system is in use throughout the tunnel connecting with the east and west end stations.

E. H. MCHEERY,
Engr. in charge.

Control of Trains on Grades.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In your record of train accidents for July twelve of the collisions were caused by trains breaking in two; in seven instances the rear part ran into the forward section; in four the train parted when ascending a grade, the rear part run-

ning back into a following train, and there was one case where a train broke into three parts. There was one other case which occurred on the L. & N. on the 16th near Jamison, Ala., and which you have not attributed to breaking in two, but which should be so classified, where the forward portion in returning backed into the detached section. Your information is that six of these collisions occurred on a grade. It would be unfair to charge that they were caused by negligence without further particulars, as to time of day, conditions of weather, etc.; but there are two instances which appear inexcusable. One on the 25th on the Chesapeake & Ohio, where an engine broke away from the cars and was afterwards run into by them, and the one on L. & N., already referred to, where the engine, returning at considerable speed, ran into the detached part. It is difficult to comprehend how a detached part on an ascending grade could get away from the trainmen if they were awake and at their proper stations. I claim that there need be few, if any, serious disasters from trains breaking in two if the rules are intelligently lived up to and some judgment exercised.

A very important rule, and one that should be rigidly enforced that disasters from this cause may be averted, is No. 226, Pennsylvania book of instructions: "Conductors must see that the couplings and brakes of the cars in their trains are in good order before starting, and inspect them when the train stops for water, or for other trains." This inspection of couplings, etc., is also enjoined upon the brakemen by rule No. 243. If the conductor when taking the car numbers of his train would glance at the couplings, his practiced eye might frequently detect a cracked link or pin, or bad drawhead. He should know that the brakemen faithfully perform their duty in this matter, one walking along either side of the train.

The next consideration is the proper handling of trains on heavy grades. In ascending, as well as in descending them the brakemen should be required to remain at their posts. Many conductors permit their men to go back to the caboose to get something to eat when ascending a long grade. My experience is that a train is more likely to part than when descending, particularly if the engine is slipping. Rule 227 says conductors must see that the brakemen "keep their positions and use the brakes properly, particularly when descending heavy grades." To what part of the train should the brakes be applied when descending heavy grades? It never occurred to me until recently that there was a difference of opinion on this subject. Those who advocate that the front brakeman should control the train, claim that the train all being together, a car can be dropped into a siding with more ease; but we are not running local freights, to which that view of the case is alone applicable. They also say that a train is less likely to part, but they do not advance any intelligent reason in support of this assertion. If a train is controlled on a descending grade by the front brakeman, all the cars behind those on which he has applied the brakes are together, and they jolt more than if the slack were stretched out and the train drawn taut, and a pin or drawhead key is more likely to be jolted out of place; then when the engineman uses steam at the foot of the grade, the strain is very severe on links, pins and drawheads, particularly if there is a grade to ascend. My experience is that the rear brakeman should take the slack of the train just before the engineman shuts off steam, or before the cars run together, and he, with the assistance of the middle man, who when descending heavy grades should work not more than 12 or 15 cars from the caboose, should control the train. The rear man should not release his brakes entirely until after the engineman uses steam, and the brakeman feels that the train is all together.

There is no question in my mind about this being the proper way to control a heavy freight train. The conductor knows that at least two of his men are on top, whereas if the front man controls the train, the remainder of the crew may be in the caboose, and the first intimation they receive of the train being parted is when it comes together in collision. Control the train from the rear end, and if it parts, the brakes are already applied to it, and a few more will stop it before a collision is possible, unless the engineman, contrary to instructions, stops the forward part too soon. The flagman can get off and go back to protect the rear before it stops, leaving the middle man or conductor to observe Rule 247, which says that after he has brought the detached portion to a standstill he must "send forward the most reliable person he can command to make danger signals until the front portion of the train comes back, etc."

If the men on the forward portion of the parted train observe Rule 100: "Enginemen must keep the front part of the train in motion until the detached portion is stopped. * * The front portion before going back must first send a man with danger signals 900 yards in advance, and running with great caution at a speed not exceeding four miles per hour," it occurs to me that wrecks like that at Jamison station must be the result of gross recklessness. The majority of the collisions which occur from detached portions coming together are caused by negligence or by inability of the trainmen to put into practice the latter clause of rule 121, which reads, "they must take every precaution for the protection of their trains, even if not provided for by the rules." LANGDON.

The Road Foreman of Engines.

The rapid growth of railroad systems and the consequent increase in the number of employees necessary to promptly handle the business, have caused the creation of new departments, with the especial object of facilitating some of the multitudinous duties that formerly devolved upon other officials, who from early custom, or from a desire to economize in operating expenses, were given charge of various de-

partments of the service that became unwieldy with the gradual development of the larger railroad systems. These offices were ultimately subdivided, and the titles bestowed upon the heads of the new departments were unknown in early days of railroading. One of the many new officers thus appointed was the Road Foreman of Engines, or as he is entitled on some railroads, the Traveling Engineer. His duties are important, and if properly selected and capable, he can effect important economies in the handling of locomotives. It is therefore remarkable that few of the railroads of this country have reached that stage of progress where such an official has been appointed. Even where the question has been considered, progress has been prevented by objections advanced by other officials in the motive power department who are loath to resign their authority, even when they know that they are unable to give a proper amount of attention to the duties that usually devolve upon the road foreman. In many cases the road foreman when appointed is considerably hampered by restrictions of authority.

On those roads that have appointed road foremen of engines and have given them the proper authority much good to the service has resulted. This is evidenced by the performance sheet, the elevated character of the employees properly made subordinate to him, and the decidedly better condition of the locomotives.

Upon the proper selection of this officer depends the success with which his department is operated. He should be selected with especial reference to his ability as a locomotive engineer, and if not a full fledged machinist should have at least a knowledge of what constitutes a good mechanical job of the many required on the ordinary locomotive during the wearing out process. He is a decidedly better and more valuable man when he possesses both of these qualifications in a high degree, and if selected from among his fellow engineers should already possess their confidence and esteem, else his work will be a dismal failure and his life an unpleasant one.

Custom on various roads places engineers and firemen under the immediate direction of various officials, the division superintendent, train master or master mechanic, usually the latter. As the master mechanic, if his shop is a progressive one, has his hands full in attending to the details of construction and repairs, he can but imperfectly give personal supervision to engineers and firemen and the machines they handle. This being the case, the duty of looking after such details usually devolves upon the round house foreman, with possibly another man at the opposite end of the line with the same title and equal authority. Their duties should be simply to attend strictly to the care of locomotives while in their immediate charge, and get them ready for the road in the shortest possible time when needed.

Tact and firmness are necessary adjuncts to the successful road foreman of engines, locomotive engineers being a very difficult class of railroad employees to handle.

Being properly appointed by superiors who have perfect confidence in his ability and discretion he is worse than useless if not given ample authority to carry out the duties to which he is assigned. The division superintendent is responsible for the prompt and economical handling of the traffic, and therefore has the supervision of all of the attaches of his particular division or territory. The road foreman of engines should, therefore, report directly to the division superintendent, and make special reports to the superintendent of motive power, giving such particulars as may be required of the conditions of locomotives and the supervision of tests of the many particular devices constantly being placed upon engines to ascertain their utility.

It is not well to assign him too much territory. Long journeys waste much valuable time which, if concentrated on the ordinary division and branches will enhance his value. For this reason, when practicable, his headquarters should be midway between division terminals.

Briefly, the duties that should devolve upon him are:

1. Charge of the entire engine assignment of his particular division.
2. Supervision of engineers and firemen.
3. To direct the proper handling of engines.
 - a. Judicious use of stores.
 - b. Economical use of fuel.

Being in charge of the motive power and thoroughly familiar with the efficiency of each engine, he is well qualified to assign to a given train the engine that will best do the work.

In the matter of running repairs engineers are usually held responsible, but the road foreman should frequently consult with the master mechanic and round-house foreman on points that are constantly arising, having especial reference to the life of the various parts of the engines and practice in caring for the locomotive generally. Much depends upon the pleasant relations and necessary harmony which should and can be established in such conferences, the duties and relation of each to the other being thoroughly understood and appreciated.

The greater portion of his time must necessarily be spent on the road riding upon the locomotives, carefully observing their working and condition in detail, making such memoranda as will enable him to make an intelligent periodical report to the proper officer of their condition and efficiency. The over or underloading of engines being a vital question in the movement of traffic should receive his careful attention and prompt advice be given his superior officer.

Brought in close relations with engineers and firemen, the road foreman of engines has ample opportunity to observe the methods of each, to encourage those of his men who endeavor to economize in the use of fuel and stores, and to create for themselves a record of which he may be proud,

Form 1.

MONTHLY REPORT ON CONDITION OF LOCOMOTIVES

DIVISION, FOR MONTH OF 188

Engine No.	Class.	Date examined.	Boiler.		Fire-box.		Flues.	Tires.	Tender.	On what train.	General condition.
			Condition.	Date last tested.	Condition.	Date of stay bolt examinations.					

INSTRUCTIONS TO FOREMEN OF ENGINES.—"Remarks on condition of engines;" Thorough repairs—Fair working order—Order for shop—Report passenger, freight, ballast and shifting engines each class in the order of their numbers, to be registered under the following heads: 1. Passenger engines in service. 2. Passenger engines extra. 3. Freight engines in service. 4. Freight engines extra. 5. Passenger and freight engines on branches. 6. Work engines. 7. Engines in shop. Work engines include all engines used on construction, distributing, ballast, wood and ditching trains. NOTE.—This report should be made out and forwarded to the Superintendent Motive Power, so as to be received without fail on the 2d day of each month.

Road Foreman of Engines.

and to check those who he finds from need of proper instruction, or, through general carelessness, are wasteful of the company's money. He must, of course, take men as he finds them already in the company's employ, and by all proper means within his power endeavor to raise the standard of his men above the mere machine. He should be given authority, subject, of course, to the approval of his superior officer, to employ new engineers and firemen, when it is necessary. He should carefully examine each applicant as to his fitness and require unimpeachable credentials. He should aim, however, to "grow" his own engineers of the very best "timber," selected from among the applicants presenting themselves for positions as firemen. In this stage of the future engineer's career is the key to the future quality and excellence of his men, for, by a judicious selection of the fittest, considered from many standpoints, of which intelligence is not the least, the road foreman of engines paves the way for having a first-class lot of engineers.

Having employed his fireman, his next care should be to see that the man is properly instructed in his multitudinous duties, which may be done by placing him for a few trips in charge of others whose work is of the highest order. Men are prone to follow first impressions, and many otherwise good firemen have been utterly spoiled by improper methods taught by inefficient and careless instructors.

In the promotion of firemen to engineers the road foreman of engines should require the candidate for the honors and important trusts about to be bestowed upon him to pass a rigid examination as to his qualifications for the position of engineer, and may advantageously, from a series of the usual questions given the candidate, decide upon a fair average of correct replies to establish his fitness for promotion. Where practicable he should require the prospective engineer to demonstrate practically on one of the old engines usually found side-tracked awaiting retirement, the disconnecting process he would employ in various accidents likely to occur, methods of keying up rods, etc., etc. The candidate's proficiency in train rules must, as a matter of fact, be well ascertained, a duty usually devolving upon one of the transportation department officials. Promotion among engineers to more responsible duties should, as a matter of course, be in the order of succession with the oldest in point of service, capability to perform successfully the particular service being duly considered.

The road foreman of engines should have access to all records pertaining to the performance of the men and engines under his charge, and the information there obtained if used judiciously in a comparative way, is an incentive for the best of his men to do better, and the poorer to emulate the best. The consumption of fuel, being about the largest item of expenditure in the motive power department, should be given the greatest consideration by the road foreman, and he should endeavor to reduce the consumption to a minimum for a given amount of work.

The number of engines he may look after successfully largely depends upon the amount of territory through which they may operate, but it may be safely assumed that 100 locomotives is as many, under average conditions, as he can handle properly without assistance.

It is customary on the Pennsylvania lines for the road foreman to submit a monthly report of the condition of locomotives to the division superintendent and superintendent of motive power. A copy of the blank form employed is subjoined herewith (see Form 1), and will fully explain itself in detail. The information contained in this report must be necessarily brief and condensed, but it may contain the essentials of all that is necessary for heads of departments to know, and by them is intelligently understood, through a key of standard expressions which conveys, in a most accurate manner, the exact condition of each engine. In collecting the information for this report, in the course of his daily routine of duties, the road foreman gains a more intimate knowledge of all of his engines in every detail than is possessed by any other official, and is consequently more capable of advising the nature of the repairs each engine should receive in detail as it goes into the shop, and with a discrimination which must mean a minimum of cost for repairs.

The blank form used by road foremen of engines on the Pennsylvania lines for reporting the repairs necessary to engines going into shop is also appended (see Form 2), and will show to what extent the system may be applied, and its simplicity requires comparatively little clerical work. The road foreman of engines is certainly the proper man to decide when the engine is ready for shop, as well as when it

Form 2.

Mr. Supt. M. P. Dear Sir: The following is a list of REPAIRS needed on Engine. Class. on account of. Sent to. Shop.

Examined.	Repaired.	New.	Work done.	Examined.	Repaired.	New.	Work done.	Examined.	Repaired.	New.	Work done.
Air pump.				Fire-box, throat sheet.				Rocker arms.			
" signal.				" stay bolts.				" boxes.			
Arch brick.				Fire-door.				Rods, main.			
Ash pan.				" frame.				" side.			
" dampers.				" latch.				Rubber casting.			
Axles, driving.				Flues.				Sand-box.			
" truck.				Foot boards.				Scoop, water.			
Bell.				Frames.				Shoes and wedges.			
Boiler.				Frame clamps.				Smoke box extension.			
" braces, back.				" pads.				" deflector.			
" front.				Gauge, air.				" door.			
Boxes, driving.				" cocks.				" hopper.			
" engine man's.				" steam.				" netting.			
" fireman's.				" water glass.				" stack.			
" link and pin.				Guides.				Springs.			
" tool.				Guide yoke.				Spring rigging.			
" truck.				Head light.				Steam chests.			
Brakes, driver.				" boards.				" chest casings.			
Bumper, front.				" brackets.				Tender brake rigging.			
Cab.				Injectors.				" cistern.			
" irons.				Jacket.				" floor.			
Cross-head.				Lift shaft.				" frame.			
" pins.				Links.				Tires.			
Cylinders.				Link hangers.				Throttle lever.			
" casings.				" blocks.				" rigging.			
" cocks.				Packing, spring.				" stem.			
" cock rigging.				" steam.				" gland.			
" heads.				Paint and varnish.				" valve.			
" head casings.				Pedestals.				Truck, engine.			
Damper rigging.				Pedestal caps.				" wheels.			
Dome cap.				Pilot.				" wheel cov.			
Draft iron.				" braces.				" tender.			
" pins.				Pins, crank.				" wheels.			
" wedge.				Pipes, arch.				Valves and fittings.			
" casting.				" dry.				" check.			
Drawhead, back.				" feed.				" main.			
" front.				" sand.				" safety.			
Drop grate bars.				" steam.				" tank.			
Eccentrics.				" talow.				Valve rods.			
Eccentric rods.				Piston.				" stems.			
" straps.				" rods.				" stem glands.			
Exhaust column.				" rod glands.				" yoke.			
" nozzle.				Port cocks.				Water grate.			
Fire-box.				Rails, hand.				Wheel centres, driving.			
" back sheet.				Reverse gear, steam.				" covers.			
" crown.				" lever.				Whistle.			
" flue.				" rack.							
" side.				" reach rod.							

REMARKS:

Road Foreman of Engines, Division.

Form 3.

CLASSIFICATION OF REPAIRS TO BE DONE TO LOCOMOTIVES, WITH ESTIMATED TIME REQUIRED FOR THE DIFFERENT CLASSES.

No. of engine.	Passenger, freight or construction.	Class of repairs required.	Date when to go to shop.	Remarks.

NOTE.—Nature of repairs, with the time required for such repairs, can be classified as follows:

- No. 1. New boiler and general repairs to machinery—90 days.
- No. 2. New fire-box and general repairs to machinery—75 days.
- No. 3. Re-setting of tubes and general repairs to machinery—40 days.
- No. 4. Re-setting of tubes, turning of tires and slight repairs to machinery—25 days.
- No. 5. Slight repairs, such as facing valves, etc.—5 days.

should go in for repairs, his endeavor being to keep it on the road and going, as long as judicious for the service.

A further and exceedingly valuable report is made semi-annually to the superintendent of motive power by the Pennsylvania road foreman of engines, termed the "Possibilities" report. This report (see Form 3) may contain an entire list of the engines in his charge, giving, by a well adapted classification, the character of the repair each engine is likely to receive during the ensuing six months. There are five classes of repairs employed, as will be noted on the margin of the form, to each of which there is a money value of cost attached, being the result of an average cost obtained from a large number of engines repaired, and from which quite an accurate estimate may be obtained of the probable expenditures for repairing locomotives for a period of six months in advance, the result of legitimate wear and tear. In compiling such a report only the most intimate knowledge of the condition of the locomotives and the character of the service enables the road foreman of engines to make it with any degree of accuracy.

It will be seen that none of the three forms here given

could be readily abbreviated in any particular and their especial value in connection with the duties of the road foreman of engines is evident.

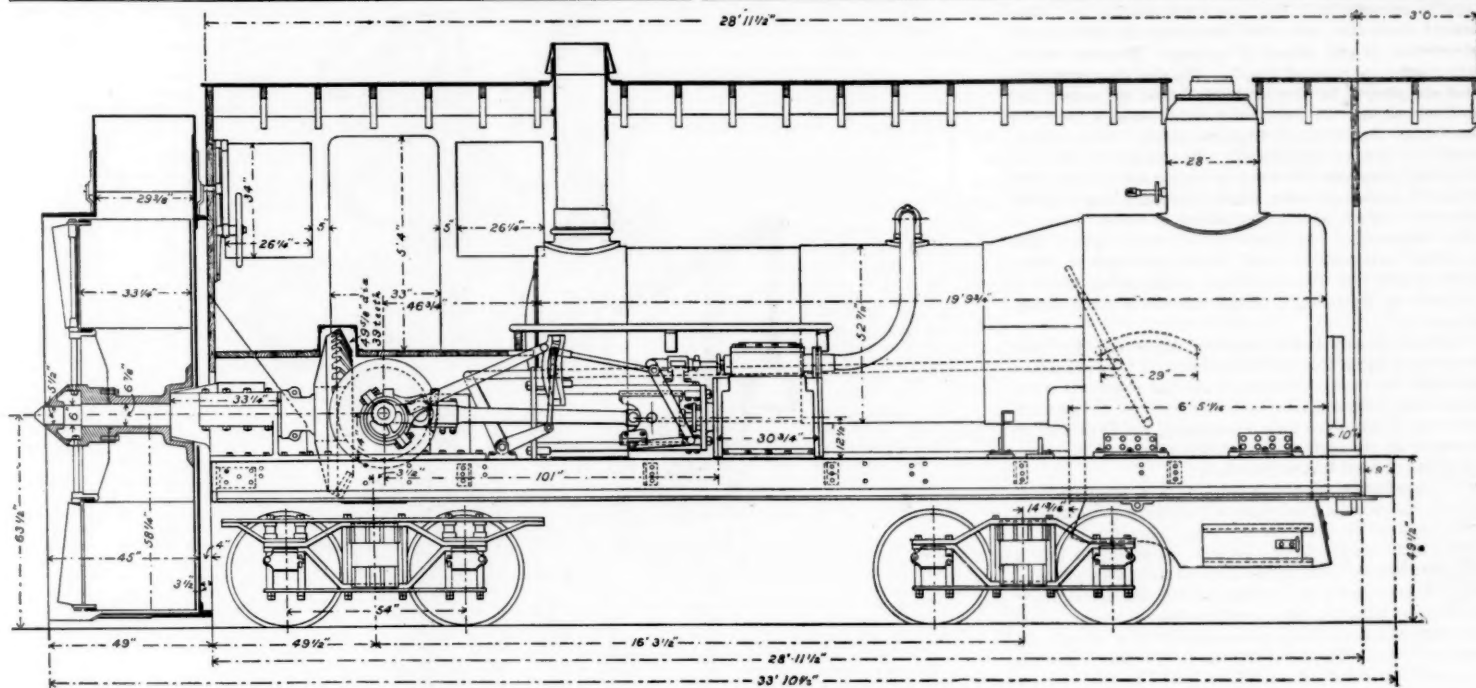
It has not been our purpose in this article to deal with minor duties of the officer in question, but to present the larger and more important ones.

Properly supported, the road foreman of engines is a valuable official, who could be advantageously employed on many railway systems where his appointment is not yet contemplated, or if appointed his authority is very limited or hampered by so many "bosses" that his position is a burden and an annoyance, and he becomes a mere figurehead.

IXION.

The Leslie Rotary Snow Shovel.

The accompanying illustration represents the latest form of the Leslie Rotary Snow Shovel, as now constructed by the Cooke Locomotive Works, of Paterson, N. J., for the approaching season. Sixteen of these rotary shovels are now building, including three for narrow gauge roads. Two



THE LESLIE ROTARY SNOW SHOVEL.

Built by the COOKE LOCOMOTIVE WORKS, Paterson, N. J.

will be completed by Oct. 15, and the others will, it is expected, be finished in time for the first heavy snow fall. Some alterations and improvements have been introduced, but the general principle of the shovel remains unaltered, as shown in previous illustrations.*

The general construction of the rotary is well known to the majority of our readers, but a brief description may be useful.

A stout frame of heavy I-beams is mounted upon two four-wheeled diamond trucks, the whole construction being of extra strength. This frame carries a large locomotive type boiler with a fire-box which extends the full width between the wheels, as shown in the rear elevation. This boiler supplies steam to two 17 x 22 cylinders with Walsheart valve motion. Each cylinder works a short shaft on which is fast a bevel wheel, 33 in. diameter on pitch line. These bevel wheels gear into a larger bevel wheel, 49 1/2 in. diameter, on pitch line, fast on the main shaft driving the knife wheel placed in the front of the machine. This wheel is 9 ft. in diameter, and is set in a round casing with a flaring square front 10 ft. wide and the same height. This casing serves to feed the snow into the wheel from the corners of the cut. The wheel contains an inner and outer series of knives. These knives are pivoted on radial pins, and the surfaces of the knives being inclined to one another, the knives are canted when they encounter any snow, and are set so as to slice it off and feed it into the machine. Behind these knives and on the same shaft is a fan wheel composed of a number of radial blades. As the whole wheel is revolved at considerable velocity the centrifugal force causes the snow to fly to the outside of the fan wheel, and as the latter is surrounded by a casing the snow can only escape where an opening is provided for it. This opening is at the top of the wheel immediately behind the headlight. The opening is provided with a movable hood, so that the stream of snow can be regulated, and made to fly either to the right or left of the track.

The boiler and engines are protected from the weather by a strong house.

The rotary is under the charge of a pilot, who stands on a platform immediately above the bevel wheels and in front of the smoke-box. By a system of signals he controls the engineers on the rotary and pusher, and by a hand-wheel can alter the position of the hood that directs the stream of snow to either side. He has also charge of the ice breaker and flanger for cleaning the rails after the main body of the snow has been removed by the rotary.

The ice breaker is a stout blade of steel, hanging in front of the front wheel of the front truck, and so attached to the journal box and frame of the truck that it rises and falls with the movement of the front truck wheels, and consequently maintains a fixed position—about 1/2 in.—above the top of the rail. The ice breaker and the flanger which follows it can be raised several inches above the track by means specially arranged for this purpose and described below.

The flanger, which clears out snow from both sides of the rail for a distance of about 12 in., is attached in a somewhat similar manner in front of the rear wheel of the front truck.

The eight-wheeled car as above described is followed by a tender carrying water for the supply of the boiler. These two vehicles are propelled into a snow bank by one or more locomotives, as may be required, according to circumstances.

The machines have been found to work so successfully that

the alterations are only in detail, and involve no departure from the principle of the rotary.

The snow flanger and ice-plow, which are not shown in the engraving, are now mounted somewhat differently, though the construction and position of the ice-plow and flanger are unchanged. As formerly arranged, both had to be lifted, by means of a steam cylinder, on approaching frogs and switches. If, however, the pilot who controls the rotary shovel and stands in the front part of the house immediately behind the wheel is unable to locate the frogs, etc., it is obvious that the ice-plow would strike and be disabled. To minimize this inconvenience, a safety link was used to suspend the ice-plow. This link being purposely weak was alone broken, and being easily replaced, the delay caused was very slight.

In the present arrangement nothing is injured should the pilot forget the locality of frogs and highway crossings or other similar obstructions. The ice breaker and flanger are hung by springs, which are sufficiently stiff to keep the ice-plow and flanger to their work, but yield when they strike a solid obstruction. The ice-plow and flanger are consequently lifted clear and return to work when the obstruction is passed.

The ice-plow and flanger are now lifted out of gear by eccentrics on the rear end of the main shaft. These eccentrics are normally out of gear when the flanger and ice-plow are at work. The latter are lifted when the eccentrics are thrown into gear by a clutch which can be operated by the pilot.

Experience has shown that it is advisable to keep the knife-wheel always running. If there is only a very little snow on the track, it soon collects as the snow-shovel is pushed ahead by the locomotive, and it is more convenient to get rid of it by constantly running the wheel at a slow speed than to wait until the snow has accumulated. It is also more convenient to have the wheel running when a snow drift is unexpectedly encountered.

The other improvements comprise an alteration in the front and lower part of the knife wheel casing, which is expected to diminish the resistance in passing through hard packed snow and ice. The knife wheel is placed nearer the front edge of the casing, so that the snow is more easily gathered in.

The roof of the house has been strengthened and made flush from end to end, whereas it was formerly highest over the front where the pilot is located. The number of windows has also been diminished, and the windows are divided into several small panes, so that a broken pane can be more easily replaced.

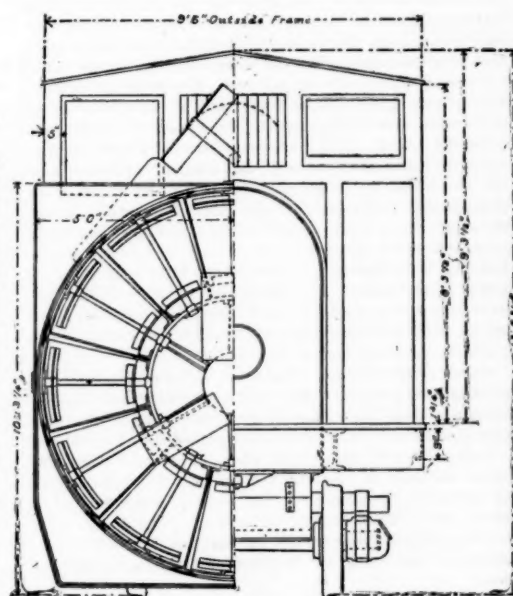
The boiler is provided with a brick arch, and a single nozzle blast pipe is used, and it is anticipated that these and other minor improvements will improve the steaming power of the boiler.

The weight of the rotary in complete working order is about 110,000 lbs.

An American Superintendent in England.

Major E. T. D. Myers, General Superintendent of the Richmond, Fredericksburg & Potomac, who is well known to many of our readers, sent to the Superintendents' Association the following notes made on a recent trip in England.

"The difference between our own and the English ways and methods is so great that it is rather difficult to give correct conclusions regarding them. Of course their works are more solidly built; as a rule stone or brick (the latter, I think, greatly in excess of the former) is used where we should be content with wood. The principal thoroughfares are carried over or under the track, or 'way,' as they call it, either



Front Elevation.

Hind Elevation.

on arches, through tunnels, or on iron girders. Grade crossings are rarely seen even for farm roads. On the great lines, where four tracks are often seen, the cuttings are very long as well as the embankments, and the slopes generally so flat that you feel more as if you were traversing a natural valley or along a ridge than an artificial work. Drainage is most scrupulously and expensively provided for and very costly retaining walls at the foot of the slopes in cuttings are common features.

"The double headed rail is universally supported on every tie by heavy cast-iron chairs in which the rail is secured by wooden keys or rounded wedges. The chairs themselves are held down by screw bolts and by wooden trenails. The fitting of all this is done with precision. The chairs and ties are 'assembled' before their delivery to the 'plate layers' so as to be exactly in gauge and so adjusted as to have a 'cant' for the top of rail corresponding to that of the tread, viz.: one in twenty towards the centre of the track. The rails are from 86 to 90 lbs. per yard in weight, and the ties 3 ft. apart on centres, all squared and uniform in size. The joints are suspended and clamped by heavy fish bars, not angle-bars. The alignment and surface are, of course, very fine. The ballast, which is largely gravel and cinder, is heavy and is disposed in various ways, the prevailing fashion being to fill in nearly to the top of the rails over three tie spaces and then leave a trough or gutter below the base of tie between two. This practice is, I am informed, about to be discarded by the London & North Western.

"Their frogs are rigid and laid in heavy castings, and all the switches are what we call split. The use of interlocking signals is well nigh universal, and the absolute block system equally so. I have traveled on single as well as double lines, on narrow as well as on standard gauge roads, and nowhere as yet have I seen a train order given. The staff system is largely employed on the single lines, which means simply that the possession of a brass mounted baton by the driver or guard (conductor) of a train gives the right to track over a given section, and no train can move over that section without it. This insures against collision, but must be, under certain circumstances, exceedingly inconvenient.

"As you are aware, the passenger cars are subdivided into

*The Rotary as first constructed in Canada was illustrated in the *Railroad Gazette*, Sept. 12, 1884. The first Rotary constructed in the United States was shown in the issue of April 24, 1885. Further illustrations, showing also the work performed by the Rotary, appeared in the *Railroad Gazette*, April 20, 1888.

compartments, labeled first, second, and third class, and are occupied accordingly. They are much smaller and more confined than ours, and, with few exceptions, without any convenience or any means of heating. They are simply stage coaches on railroad wheels. The first class accommodates six persons in very luxurious seats; the second and third, ten persons on seats comfortable enough for a few hours' ride. The motion of trains is smooth, but not more so than on the best American tracks. The changes of direction are almost imperceptible, even on pretty stiff curves; first because of the less overhang allowed, secondly because of the compressed buffers; and to some extent, no doubt, because of careful alignment. I have seen no cars with bogies. They are simply supported on from two to four pairs of wheels rigidly attached to the frames, an arrangement which is conducive to lightness, of course, but which could hardly suit us.

"You will be surprised to learn that the brake-blocks are of wood both on the cars and locomotives. I have not seen a brake shoe anywhere. The freight cars are small four wheel affairs, often with no brakes and often with the old-fashioned lever, which, when you were a youngster, you have seen on the tender of the engines. In 'shunting' the men stop them with sticks of wood laid on the track.

"The hap-hazard, go-as-you-please way of handling 'luggage' is very peculiar, and there is absolutely no safeguard against loss of it. But, on the other hand, it is carefully handled at the stations by the porters. They slip it into a compartment very often on the same carriage with you, and when you arrive at your destination you are immediately waited on by a porter, and in less time than you would think, your traps and yourself are packed in and upon a cab, and you are whirled off to your lodgings. Of course, you fee everybody for every thing, and for a liberal fee one can get almost any amount or kind of service. At the great terminal stations you can get elegant hotel accommodations, refreshments, books, etc. The buildings are vast, and are so arranged that your cab comes under the same roof with your train, and close to it, opposite the car door. The waiting-rooms are very gloomy under a London sky, and we have nothing to learn from them in that respect. The women of England are generally robust, and in consequence are not treated with so much delicate respect as ours. But courtesy and kindness are the prevailing characteristics of the usual run of the commonality of England. I have said nothing of the 'goods' stations at which hydraulic machinery is so largely employed, because it would be quite a task to describe it except orally. Indeed it is difficult to do justice to any branch of my subject in a brief paper. For instance, as to 'slips' I have observed their treatment, and have talked with engineers about them. The cure is drainage, the means of providing which I will try to describe when we meet. * * *

"Dust is seldom seen. Cinders are equally rare, smoke almost entirely avoided. The coal is of a very much cleaner character than ours, there is hardly any slack or fine coal used, and there is more complete combustion. The exhaust is very gentle compared with ours. The duty demanded of the machine is less and the fire is not forced and torn to pieces by the draught. The engines make very little noise; there is no clanking or rattling about them. The fire door, which opens inward, not outward, is never entirely closed, so that some air is constantly admitted above the fire."

Car Mortiser and Borer.

The accompanying illustration represents a No. 6 car mortiser and borer made by the Egan Co., of Cincinnati. The machine has a graduating stroke and an auxiliary boring mandrel, and is a heavy and substantial machine, designed to cut any size mortise from $\frac{1}{4}$ in. to 3 in. wide and 6 in. deep in all kinds of wood.

The column is one hollow casting, and is claimed to be strong enough to stand up to the heaviest strain, to which a machine of this kind is subjected. The tight and loose pulleys are placed on the fly-wheel shaft to run between bearings, thus equalizing the strain of the belt and keeping the shaft in line. All the working parts are planed perfectly true and are accurately fitted and gibbed, which allows the machine to cut a perfectly straight mortise.

The chisel mandrel is large in diameter and is made of cast steel. It is connected to a solid ram working in planed ways, in order the mandrel shall not spring even when mortising the hardest kind of wood at the full stroke.

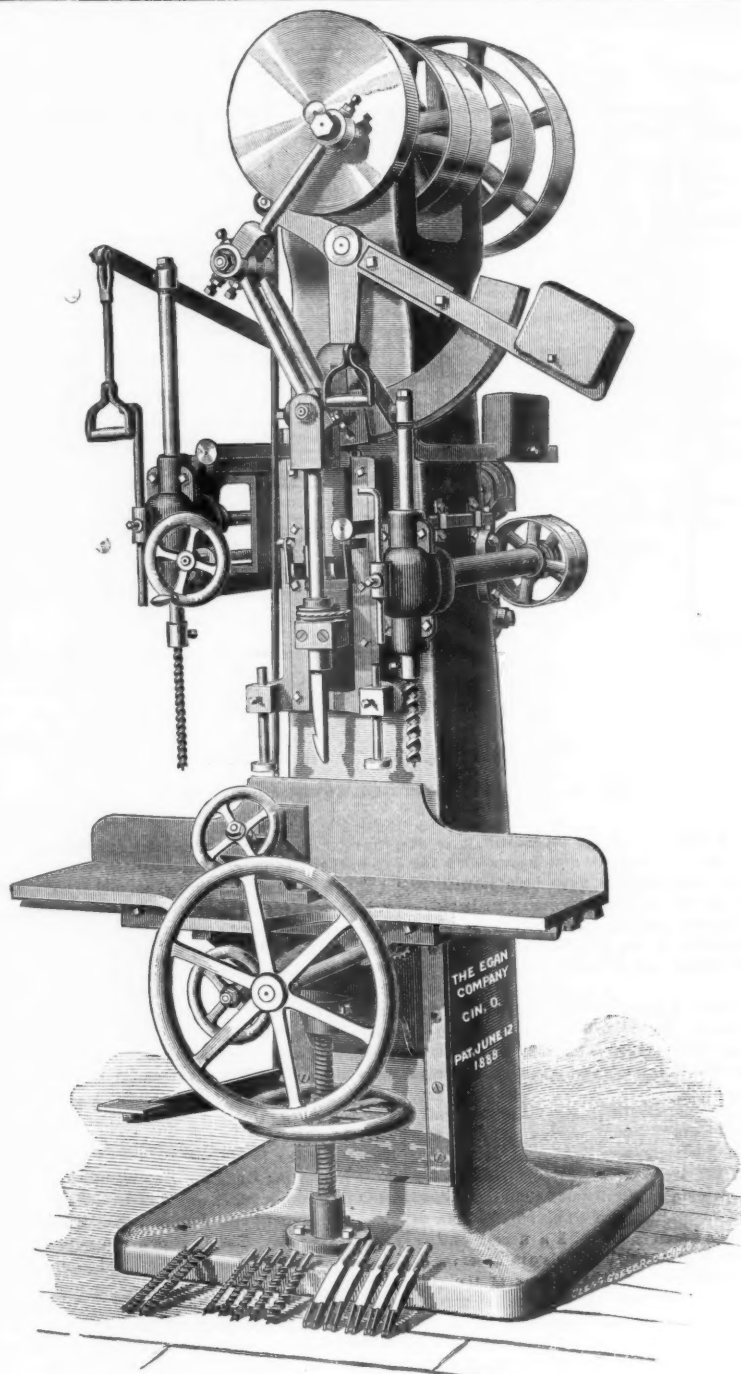
The patent chisel reverser is new and automatic. It is controlled by the treadle movement operating upon the chisel mandrel, and reversing the chisel every time the treadle is brought to the up stroke.

The patent radial slide is recently patented, and is attached to the connections and operated by the treadle, and prevents the slightest jar on the foot, even when mortising without first boring a hole to admit the chisel. It is claimed that this has never been accomplished heretofore on a machine of this class.

The bed is very large and is raised and lowered by a right and left hand screw, placed vertically between the bottom of bed and base of column. It has a lateral movement of four feet and a cross movement for mortising 16-in. timbers.

There are two boring mandrels. One is in line with the chisel and is intended to bore the hole for the chisel to start to work in. The auxiliary mandrel has a 16-in. stroke, and may be moved by a hand wheel and screw to bore at any point within the width of the bed, which is 18 inches. Each boring mandrel is driven by a pulley on the machine, making the machine complete and self-contained.

One of these mortisers was recently shipped to the American Refrigerator Transit Co., St. Louis, Mo., for use in their



CAR MORTISER AND BORER.

Made by THE EGAN CO., Cincinnati, Ohio.

car shops, and they write Aug. 21, 1888: "The mortiser is running in fine shape. Mr. Steinbrenner extends his compliments and says it's the finest machine he has seen."

The manufacturers present it as the most improved tool of its class on the market. Any of our readers desiring further particulars may address the builders, the Egan Co., Cincinnati, Ohio.

Bridge Failures.*

The concluding portion of Mr. Geo. H. Thomson's paper on "Mechanical Pathology Considered in its Relation to Bridge Design" is given below.

The writer has, for fifteen years, been in a situation to observe the wear of a considerable mileage of riveted work, erected between the years 1859 to 1873, and out of a long list of bridge accidents due to collisions from trains, engines and canal boats, has seen no failure of structure therefrom. He may be, therefore, excused in his advocacy of lattice bridges for railroad service, for all over grade (through) spans up to 250 ft., and for advancing his views concerning the design of bridges for the future, as follows:

1. That integrity of form, that rigidity and staunchness, peculiar to riveted work, and so essential in railroad bridges—so appreciated in America to-day in the "through" plate girder—is an element of value in that railroad struggle for existence to come, between structures and wheels, and is worthy the attention of those that maintain railroad structures with heavy tonnage.

2. That the accepted methods of dimensioning the members of a railroad bridge from strain sheet and unit stress data, is not sufficiently comprehensive of the difficulties to be overcome, and is not in accord with our mechanical intuitions and experience, and should not, therefore, be the only criterion of design.

3. The design of the future should comprehend the work of the future, and should be liberal in the quantity of material used, and judicious in its structural disposal, as well as careful in its selection and manufacture.

That cars will weigh, with load, two tons per foot at no distant day—that engines will increase in power and adjuncts—that other conditions, at present unknown, may

arise which will require the exercise of forethought and judgment on the part of the engineer, is highly probable. Precision in the calculation of stresses from wheel loads considered statically imposed, and figured to the pound, will not aid us here. A bridge does not hold up the better under the adverse conditions incidental to railroad operation for such precision.

4. The various members of a bridge should be considered in its possible pathological as well as in its physiological relations. The sections of the various members of a truss can be made of shapes (of some considerable moment of inertia) to withstand any work, whether in tension, compression, or transversely. A web member of a truss normally may be in compression, but a collision may put it in tension or in transverse strain. A bottom chord normally in tension may be put in compression by an end post collision. If the car jumps on the chord then a beam is wanted.

A bridge, like a soldier, has sometimes other duties to perform than that appertaining to the routine life of the garrison.

5. A relatively smooth but temporary floor may be obtained by the use of long cross-ties of from 10 in. to 12 in. deep, closely spaced, and bolted to the longitudinal girders or to the chords. Such a floor is part of the bridge, and partakes of its strength, and it will support a derailed train, provided it does not catch fire; here is the danger, and the wood floor cannot be considered absolutely safe unless protected from fire or watched. In many train wrecks, whether on or off of structures, the fire demon is present. The timely arrival of the fire department, eight minutes after the catastrophe at Bussey Bridge, together with water near at hand, and other favorable combinations of circumstances, saved the lives of those spared by the bridge failure. Wood floors cannot be countenanced in first-class structures. Within a year the dangers of the wood floor have been several times vividly presented to the writer. The less timber about a railroad bridge the better; passenger cars of present type can furnish enough varnish and other inflammable material for fire wrecks—as sad experience has too often told us.

A solid plate floor with the permanent way embedded in ballast avoids the possibility of fire catastrophes, and while making a rigid lateral system does not interfere with the stretching of the chords; a smoother track can be maintained and the care of derailed trains provided for. While the forces due from power brakes are dispersed through the ballast, the loads imposed approach the static in mechanical effect. It is the floor for the future—for first class work.

6. For all through bridges the end posts should be made of

* Paper read before the annual meeting of the British Association at Bath. The first portion of this paper was given on pages 634, et seq. of *The Railroad Gazette*.

large excess of material and considered subject to transverse loading from collision.

7. The portals should be heavy plate work, and rigidly and strongly connected to the chords and end posts, so that the bridge can be made to support itself and train, standing on "three legs," the portal assisting.

8. The web system should be designed for transverse loading, imposed in the lineal direction of the bridge. If vertical members are used, the web must be necessarily very heavy, as the force is applied at right angles to the member. If the web members are diagonal, with intersections, then in case of collision they will be principally strained in tension.

9. The top lateral system should be rigid with rivet connections; this is essential.

Finally: The elastic work done by the various members of the trusses should be considered and allowed for. Those bridges so designed that each member shall not stretch more than $\frac{1}{16}$ inch of its length under full live load and work have given satisfaction.

The subject of mechanical pathology is relatively a legitimate and important study to the engineer as medical pathology is to the physician. While we expect the physician to be familiar with physiology, without pathology he would be of little use to his fellow-men, and it is as much within the province of the engineer to investigate causes, study symptoms, and find remedies for mechanical failures as it is "to direct the sources of power in nature for the use and convenience of man."

That the ideas presented herein will meet with the approbation of any considerable number of his professional brethren in America the writer does not believe; that the prevention of disasters on bridges will, at some not very remote period, receive professional attention from engineers is probable. The frequency of these failures, the long list increasing monthly, the loss of life, etc., will create a public opinion favorable towards a recognition of the views advanced in this paper.

The discussion on the paper was very brief, but the speakers endorsed Mr. Thomson's views that riveted structures would best stand the heavy engines and train-loads described in the paper.

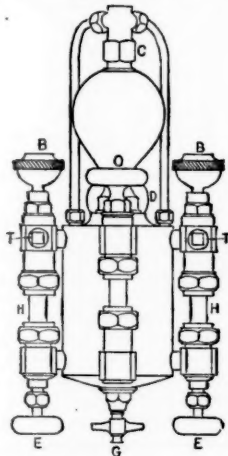
Mr. Benjamin Baker, who read the paper on behalf of the author, replied to the discussion and remarked that there was very little to say. It had been asked why the paper was sent over to England, and the answer was simply because he had asked for it. Mr. Thomson was one of the most prominent authorities on the science of bridge construction in America, and no doubt he would have a warm time with his colleagues when they came to read what he had written. The speaker wished to mention one fact. Reference had been made to English engineers and United States engineers. Now engineers looked on themselves as engineers, and did not much consider whether they were English or American, for they claimed an interest in all that was done by the brotherhood on whichever side of the Atlantic it might be. The question of nationality did not come in so far as the engineering aspect of the question was concerned; there was, in fact, no national feeling. When an American spoke of the Institution of Civil Engineers he meant the English institution, recognizing in it the parent society of engineers all over the world. If he wanted to refer to the American Institution he called it the American Institution. It is a good thing that the bond of good-fellowship and scientific interest should be strong enough to overcome narrow and senseless jealousies. Patriotism is a great virtue, but few things are more absurd than a mistaken application of its principles.

A vote of thanks to the author was proposed by the President and carried by acclamation.

The Detroit Improved Cylinder Lubricator.

The accompanying engraving represents the locomotive cylinder lubricators with which this company will hereafter supply its customers, and is known as the "Detroit No. 2 Improved."

The distinctive advantages claimed are as follows:



The Detroit No. 2 Improved Cylinder Lubricator.

1. As the equalizing pipes start from a point in the condenser above the steam inlet at C, all surplus condensation must drain back into the boiler, and oil and steam only (which are both lubricants) pass through the tallow pipes to the valves and cylinders. This is important, because better lubrication is secured with a minimum amount of oil, and absolute regularity of feed is obtained.

2. The equalizing pipes being outside the lubricator, leakage or defects are readily detected and remedied. Any overheating of the lubricator is also avoided, and a full supply of condensation is always to be depended upon.

3. In case of breakage of sight-feed glass, no steam can escape, as ports are instantly closed automatically by check valves in arms over sight-feed glasses.

4. The disabling of one side of the lubricator will not effect the satisfactory working of the opposite side.

5. To use auxiliary oilers, simply close engine throttle, and oil the same as with the old cab oilers.

The parts are indicated in the engraving as follows: B. B. Auxiliary oilers. C. Connection for boiler pressure. D. Water valve. E. E. Regulating valves. G. Drain valve.

H. H. Sight-feed glasses. J. Gauge glass. O. Filler plug. T. T. Plugs to fill glasses with water when first starting.

Any further information may be obtained of the Detroit Lubricator Co., Detroit, Mich.

A Twenty-ton Traveling Crane Worked by Electricity.

At the recent meeting of the British Association for the Advancement of Science a paper on this subject was read by Mr. W. Anderson. An abstract follows:

One of the traveling cranes in the foundry of the Erith Iron Works was originally constructed to be worked by hand; but preparations had been made to apply wire rope driving at some future time. The crane is 30 ft. 6 in. span, and consists of a pair of wrought iron girders resting on end carriages running on an elevated line of rails. The gearing for hoisting and longitudinal and cross transverse is on the top of the main girders, the hoisting chain passes from the barrel at one end over a pulley at the other, then back to the pulleys in the cross traversing carriage, which runs between the main girders, through a falling block, and thence to an anchorage under the barrel at the extreme end of the main girders. By this arrangement the crane occupies a moderate height, and the hook can come within 3 ft. of each wall. The inconveniences and wear attending the employment of rope driving gear induced the author to try whether electricity might not be used with advantage.

The dynamo, which was intended to give 50 amperes at 120 volts with 1,200 revolutions, was fixed in the main boiler house of the works, and was driven by a small horizontal engine by means of a link belt. The leads from the boiler house up to the conductor in the foundry are of 6 B. W. G. copper wire, while the conductor is formed of an angle iron bar 2 in. by 2 in. by $\frac{1}{4}$ in., extending the whole 350 ft. length of the shop, and has one face roughly ground and protected from rust by vaseline. The return current travels along one of the rails on which the crane runs. The motor, which is shunt wound, and constructed for 100 volts and 50 amperes, is fixed on the working platform of the crane beside one of the main girders. Its driving spindle carries a steel pinion which gears into a double bevel spur wheel keyed on to a shaft which runs longitudinally on the top of the girder and is connected by nests of three bevel wheels, with friction clutch connections to the three shafts which command the several movements of the crane, the means of using the hand power being still retained.

Two sets of speeds are arranged for each of the movements, viz:

	Feet per minute.	Feet per minute.
Hoisting	Slow, 3.4	Fast, 10
Cross transverse	" 25	" 105
Longitudinal transverse	" 78	" 213

To provide against undue strains upon the motor, an automatic magnetic cut-out is fixed on the crane, in addition to a fusible cut-out in the main leads, and for the purpose of varying the power and speed to meet the requirements of the foundry a set of resistance coils is provided, governed by a special switch, by means of which different resistances can be introduced into the armature circuit of the motor, or the current can be cut off altogether, but so that it must be done by steps, and not suddenly. The connection between the motor and the conductors is by means of brushes pressed against them by elastic attachments.

The handles for operating the several movements, the brake lever, the switch and the automatic cut-out, are collected together, so that a single attendant can readily work the crane from one spot. The crane was set to work in June last, and has continued to act satisfactorily ever since. As far as can be judged at present, there is no special wear to apprehend. The conductors act satisfactorily, though a considerable length is in the open air; and the dust, heat and smoke of the foundry do not appear to affect the working.

Some practice was required by the man in charge in throwing the various motions into gear without shock; but this has been easily acquired, and no hitch occurs now in the working. The load is controlled by a brake, and inside the brake wheel there is a ratchet wheel connected with the shaft by four pawls, so that when lowering, the brake wheel and pawls revolve together, while in raising the apparatus does not interfere with the motion. As compared with a rope or shaft driven crane, the electric crane has a much higher total efficiency. The ropes or shaft are always running and absorbing power, whereas the crane is only intermittently at work; hence the total efficiency is very small. In an electric crane no current is flowing when the crane is standing idle.

The Quaker Bridge Dam.

The report of Messrs. Joseph P. Davis, J. J. R. Croes and W. F. Shunk, who were appointed by the New York Aqueduct Commissioners in March last as "a Board of Experts to take into consideration the plans of the Quaker Bridge Dam, as projected by the Engineers of the Commissioners, and modifications which had been or might be suggested by others, either in plan or cross-section, and to fully advise the Commissioners on the subject," which was presented to the Commission on Oct. 1, is a clear and precise paper, although, from the magnitude of the subject treated of, rather long for entire reproduction in our columns.

The location of the dam is described and the statement made that its object is to impound upwards of 5,000 million cu. ft. of water in an artificial lake 16 miles long and 165 ft. deep at its lower end, with a tributary water shed of 361 square miles.

The dam is to be over a quarter of a mile long and about 270 ft. high at the deepest part of the valley, being 100 ft. higher than any dam yet built. It is proposed to build it of stone masonry in hydraulic mortar.

In studying the forms and dimensions of the dam, the specific gravity of the masonry is assumed to be 2.34 and the forces which the dam will have to resist are classified as follows:

First.—The quiescent and ever-acting forces, such as the weight of the masonry and the pressure produced by the impounded water, which, for this case, is assumed to stand at 2 ft. higher than the level of the spill way.

Second.—Forces produced by the expansion of ice in place or by floating masses, which are assumed to be represented by the water standing at the level of the spill way, with ice exerting a pressure of 43,000 lbs. per linear foot of dam.

Third.—Forces produced by waves of translation, the

possible cause of such waves being the giving way of a dam above or an extensive land slide, which forces are assumed to be represented by a height of water of 14 ft. above the spill way.

Fourth.—Earthquake shocks, concerning which the experts are wisely rather non-committal, contenting themselves with saying: "Earthquake shocks may vary from a slight tremor to an immeasurable force. The dam, if proportioned to resist the forces before considered, will have ample stability to withstand all but shocks of the severest nature. Probably of all the considerable structures in the region affected by such an earthquake, it would be the last to succumb."

Having thus defined what is to be resisted the Board go on to say: "To resist these forces, or at least those of them which may be considered measurable, we have agreed

"(a) That the co-efficient against overturning should, at all points, be not less than two;

"(b) That the ratio of the weight of the masonry above any horizontal plane or joint, to the maximum force tending to cause sliding or shearing along the plane, should not be less than three to two;

"(c) That the maximum quiescent stress on the downstream end of the joints at the elevation of the river-bed, 35 ft. above tide, should not exceed 10 tons per square foot (= 139 pounds per square inch);

"(d) That below that elevation, where the strength of the masonry to resist crushing is aided by the lateral pressure of the earth, the maximum quiescent stress should not exceed 14 tons per square foot (= 194.5 pounds per square inch); and

"(e) That the pressures upon the joints of the up-stream face may be somewhat greater, since they will be permanently reduced as soon as the reservoir begins to fill.

"We agree in judging it prudent that in so important a structure as the Quaker Bridge Dam these conditions should be fulfilled; and we believe that, if fulfilled, the cross-section will be amply strong for the functions it will be called upon to perform.

"Three profiles were submitted to us by order of the Board of Aqueduct Commissioners, one (X) designed by the Engineers of the Department of Public Works, one (Y) designed by the Engineers of the Aqueduct Commissioners, and one (Z) presented to the Commissioners by Mr. A. Marichal.

"None of these meet the requirements which we think should be met for complete safety.

"We were, therefore, under our instructions, as we understood them, called upon to prepare a profile which we could recommend for adoption.

"We have prepared such a profile, and herewith present it under the title of "Profile N."

"Comparing profiles X and Z with this profile, it is evident from inspection of the diagrams and tables that the pressure at the down-stream toe in the lower portion and the factors of safety in the upper portion are so different from those which we are agreed should be adhered to, that further discussion of them seems needless.

"Comparing profile Y with profile N, the chief point of difference is in the increased thickness given to N on the upper portion of the dam for about 120 ft. This increase we consider necessary to resist the shock of ice and excessive freshets."

A very good idea of the differences in these profiles may be obtained from the drawings of them, which we present and for which we are indebted to the *Engineering and Building Record*, and the following interesting comparative statement of down-stream toe-pressures at different elevations, under different conditions, in the profiles submitted to the Board of Experts and the profile recommended by them, X, Y and Z on straight line in plan. N on curve of 1,200 ft. radius.

Elevation.	PRESSURE IN POUNDS PER SQUARE INCH.							
	Water at +202.				Water +214.		Ice. Reservoir full.	
	X.	Y.	Z.	N.	Y.	N.	Y.	N.
192				22.20		25.23		27.54
184				28.66		36.34		43.58
173	36.4	47.8	38.5	37.60	91.1	52.94	1304.0	63.95
162				48.40		71.22		79.75
151	59.7	70.4	62.2	59.45	144.4	88.76	319.9	91.48
140				71.00		105.00		109.82
129	78.3	99.0	74.5	81.04	159.4	117.78	181.7	107.09
118				89.03		124.43		107.78
107	96.8	97.5	94.1	93.73	147.9	127.41	142.2	108.99
96				102.88		143.2		109.87
74	100.4	98.4	123.4	110.14	130.5	139.98	120.4	116.92
35	86.7	106.1	154.5	137.35	130.7	170.93	117.9	138.72
20	176.7	150.0		174.41	189.6	198.56	150.9	171.79
52	267.4	205.6	234.7	194.59	227.1	216.37	211.7	191.33

Passing then to the consideration of the ground plan of the dam, the Board give as the conclusions at which they have arrived regarding the relative merits of straight and curved dams:

"First.—That, in designing a dam to close a deep narrow gorge, it is safe to give a curved form in plan and to rely upon arch action for its stability; if the radius is short, the cross-section of the dam may be reduced below what is termed the gravity section, meaning thereby a cross-section or profile of such proportions that it is able by the force of gravity alone to resist the forces tending to overturn it or to slide it on its base at any point.

"Second.—That a gravity dam built in plan on a curve of long radius derives no appreciable aid from arch action, so long as the masonry remains intact; but that, in case of a yielding of the masonry, the curved form might prove of advantage.

"The division between what may be called a long radius



PROPOSED SITES FOR THE QUAKER BRIDGE DAM.

NOTE.—Full lines show rock contours below river level; broken lines, surface contours. Scale, about 215 ft. to the inch.

and what may be called a short radius is, of course, indefinite, and depends somewhat upon the height of the dam. In a general way we would speak of a radius under 300 ft. as a short one, and of one over 600 ft. as a long one for a dam of the height herein contemplated.

"Third.—That in a structure of the magnitude and importance of the Quaker Bridge Dam, the question of producing a pleasing architectural effect is second only to that of structural stability, and that such an effect can be better obtained by a plan curved regularly on a long radius than by a plan composed of straight lines with sharp angular deflections.

"Fourth.—That the curved form better accommodates itself to changes of volume due to changes of temperature.

"While danger of the rupture of the masonry of the dam by extraordinary forces, if built on the profile herein recommended, is, in our opinion, very remote, yet it exists, and because it exists, and because the curved form is more pleasing to the eye, better satisfies the mind as to the stability of the structure and more readily accommodates itself to changes of temperature, we think that it should be preferred in any case where it would cause no great addition to the cost."

The advocate of a curved dam on the ground of its greater

stability in consequence of its acting as an arch, will not derive much comfort from the above careful statement of conclusions reached by this Board after mature deliberation, nor will they be any more consoled by what follows, for the report goes on to say:

"In comparing different locations of the dam, in order to discover the one which combined most effectively the advantages of economical construction and pleasing effect, we were confronted with the fact that our calculations indicate that in a dam built upon a curved plan of large radius, the bottom down-stream toe-pressures are increased beyond those in a straight dam of the same section, in consequence of the length of the toe being less than the length of the face to which the pressure of the water is applied.

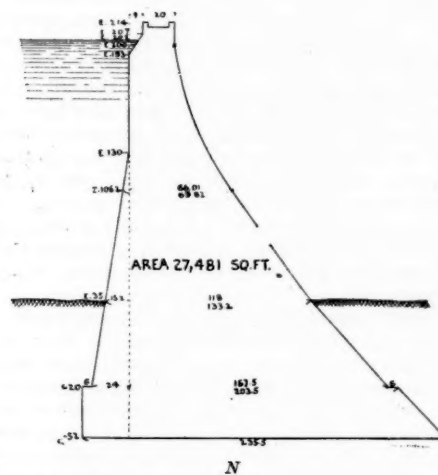
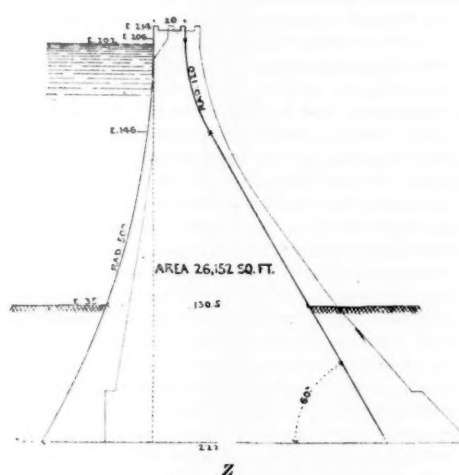
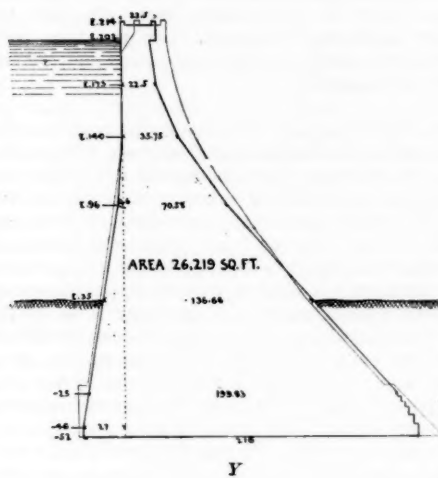
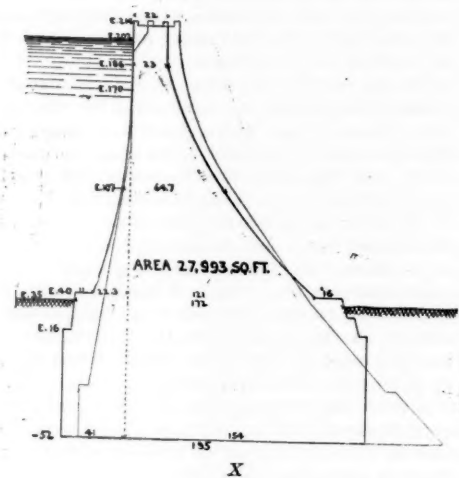
"This increase of pressure is not exactly proportional to the decrease of length of toe, but is of such magnitude that it should not be neglected in designing the section of the dam, and it involves the necessity of increasing the mass of masonry in a certain proportion to the radius of the curvature.

"To fairly compare the cost of different locations, it seemed proper, therefore, to so modify the profile adopted by us (*N*) which fulfills the conditions of stability on a curve of 1,200 ft. radius, that the limit of allowable pressure

should be approximated to in each case where the radius of curvature varied materially from that figure. The estimates of cost on different lines are, therefore, based on different cross sections of the masonry, but all of approximately the same stability under the conditions in which they are placed."

Thus for a straight line dam the profile *N*₁ of equal stability with *N* on a 1,200 ft. radius curve, is the same as *N* above elevation 106, but is 128.2 ft. wide at elevation 35, and 224 ft. wide at elevation—52, and the sectional area is 26.50 sq. ft.; and for a curve of 900 ft. radius the profile *N*₂ of equal stability, is the same as *N* above elevation 106, but is 135.2 ft. wide at elevation 35, and 239.5 ft. wide at elevation—52, and the sectional area is 27.873 sq. ft.

Applying these profiles to various locations, the Board estimate that on the angular location No. 1, recommended by the Chief Engineer, in which the line of the dam makes an elbow or sharp bend of 45 degrees 300 ft. from one end and 1,100 ft. from the other end, the cost would be approximately \$3,824,754; on the location No. 2, urged by Mr. Oliver W. Barnes, late one of the Aqueduct Commissioners, which is on a curve of 900 ft. radius, the cost would be \$4,261,850; on the location No. 3, the shortest straight line across the valley, the cost would be \$4,448,687, and on loca



PROPOSED PROFILES OF THE QUAKER BRIDGE DAM.

Profile X designed by Engineers of Department of Public Works; Y designed by Engineers of Aqueduct Commissioners; Z submitted by A. Marichal; N recommended by Board of Experts. X, Y and Z on straight line in plan; N on curve of 1,200 ft. radius.

tion No. 4, a curve of 1,200 ft. radius between the two first mentioned locations, the cost would be \$4,286,044.

The Board say:

"On this location the cost is apparently slightly in excess of that on location No. 2, but it is preferable to No. 2 in that it is 143 ft. shorter at the top, and is, moreover, better located on the east bank of the river.

"For the reasons hereinbefore given, and especially for the greatly superior architectural effect, we consider that the location on the curved line No. 4 is to be preferred to that on the angular line No. 1.

"From a strictly economical point of view, however, the location on line No. 1 is probably the best that can be found, as the quantity of masonry will be less and consequently the cost, irrespective of the expenditure needed for protection against the water of the river during construction, will be less by from \$300,000 to \$500,000 than by any line continuously straight or curved from end to end across the valley which we have examined.

"But the chief difficulty in building the dam will be in the construction of that portion of it which lies below the present river bed, in consequence of the cost, both in time and money, of the provisions for passing the water of the river by and over the work during the progress of construction, and the keeping of the pit, from 80 to 90 ft. deep, free from water.

"In general it may be assumed that of two locations equally favorable in other respects, that one is to be preferred in which the amount of work to be done below the river bed and the time to be occupied in its construction is materially less.

"With this in mind, there appears to be a very favorable location for the dam further up-stream at the entrance of the ravine, on the line designated on the map as No. 5. It starts on the promontory at the same point as No. 1 and follows a curve of 1,146 ft. radius to a point on the east bank about 600 ft. north of the north end of No. 1.

"A few borings made in 1884 and several additional ones made within the past month give indications that in general the rock lies favorably for the construction of the dam on this line. The deep valley under the river bed is much narrower than it is further down the gorge, thus making a material reduction in the items of excavation and masonry below the river level.

"The length of the crest on this location is greater than on the other locations, but the line crosses the contour lines of the rock surface more nearly at right angles, and, therefore, probably will secure a good foundation with the least amount of rock excavation.

"It presents a water face more nearly tangential to the axis of the lake, and therefore better fitted by position to withstand the impact of floating masses.

"We believe also that in case it should be thought advis-

able to pass the waters of a river through a tunnel during construction, this location would permit the driving of a tunnel on a shorter and in other respects more favorable line than would the other locations.

"When these facts are fully appreciated and weighed in connection with the possibilities of serious delays and losses by damage from freshets while the work is still below the river surface, the great importance of a more thorough examination and analysis of this location will be seen.

"The estimated cost is \$4,171,380.

"The cost of this location will, therefore, according to the best obtainable data, be \$347,626 greater than on the location No. 1, but for that portion of the dam below the river-level the cost will be \$204,084 less than on location No. 1, and \$440,958 less than on location No. 4.

"This may become an important factor in the final determination of the location of the dam. If these figures of the cost below the river level should be confirmed by further examination, we are of the opinion that this location No. 5 will be greatly to be preferred to any of the other lines."

While in the previous part of the report it is very evident that the Board of Experts do not place any particular reliance on the curved plan as adding stability, the summary of conclusions at the end of the report makes it plain that they do not, on the other hand, anticipate any evil results as likely to follow the adoption of a curved form, as has been claimed by the aqueduct engineers would be the case, owing to excessive pressure on the voussoir joints of the horizontal arch.

The Board say:

CONCLUSIONS.

"In view of the premises and pursuant to our instructions, and believing that the dam will be more pleasing in appearance and better able to resist extraordinary forces if built on a curved plan, and bearing in mind that an excessive thrust in the direction of the curve cannot be produced until the force of gravity has been overcome, and that the profile N is so proportioned that more than twice the greatest pressure exerted by any conceivable ordinary force is necessary to overcome the resistance of gravity, we recommend the adoption of the profile or cross-section N and of a curved plan on a radius of about 1,200 ft., as hereinbefore described, and we advise that the exact line be determined after further borings shall have established the most desirable location on the conditions prescribed."

To most of those who have been discussing the Quaker Bridge dam plans, we think this report will be a surprise. The conclusions arrived at and the reasons given for them are original, and show that the time spent in studying the subject has not been devoted to the mere consideration of old arguments, but also to independent investigations.

The cross-section of the dam is proportioned so as to be

stronger both at top and bottom than any heretofore proposed. The lower part is almost identical with the Chief Engineer's section, which has been most criticised in that part, and the upper part is materially enlarged over any that has been suggested, and the reason for it is made plain. The Chief Engineer's ground plan is criticised, not because it is straight and therefore weak, but because it is angular, and therefore architecturally a mistake. A curved plan is recommended for architectural effect and a sentimental stability, although it is shown that the cross-section must be increased to make it of equal stability with a straight dam.

The Chief Engineer's location is commended as being superficially the most economical, but is criticised as being less really economical when all the engineering features of the work of construction are considered, than another entirely new location. We hope that the Aqueduct Commissioners will speedily publish the document with all the accompanying illustrations, in such a form that it will be accessible to engineers and to the public.

THE SCRAP HEAP.

A Large Viaduct in Portugal.

The Fives-Lille Engineering Co., a French firm, have obtained the concession for the construction of an iron viaduct to connect the hills on the flanks of which the town of Lisbon, in Portugal, is built. The viaduct will have a total length of 4,000 ft., its greatest elevation being 160 ft. It will be divided into two nearly equal parts, connected in the middle by a large rotunda or round tower. At different points there will be hydraulic lifts for raising heavy vehicles as well as foot passengers.

Western Papers.

"What papers have you got?" asked a passenger, as a young man boarded the train at Bad Egg, Arizona, with a bundle under his arm.

"I don't know as it's any of your business; but if a possum comes for Bill Young, a mandymanus for Sweepstake Fearing, and a nol prosiqui for old Uncle Hank Eldredge, interests you any, them's it."

Nothing will put murder into a man's heart quicker than to unsuccessfully try to open a refractory car-window for a pretty girl, and have a man about two sizes bigger than he is step across and open it almost without an effort.

"Papa," what do they have that crowbar strapped up there for?" said the small boy in the railway car.

"That, my boy," replied *paterfamilias*, sinking hot and frantic into his seat with a sprained wrist and half a thumb-nail gone, after a three-minute tussle with the car-window; "that, I suppose, is for the brakeman to open these blanked windows with."—*The General Manager.*

Raub's Central Power Locomotive.

Raub's central power locomotive, built at Paterson some two years since, has started on a tour on the Erie. The latest accounts state that it has passed Fort Jervis safely.

The Buffalo Station.

A Buffalo dispatch says: "The people of this city are very much disappointed at the crushing of their Union station scheme. A high official of the Western New York & Pennsylvania denies the statement that that road backed out. An Erie attorney thinks it must be because the New York Central would not go into the project unless it could have a controlling voice in the management, and others interested lay the blame for the whole failure on the Erie. But the grade crossings must go. The Union Station fizzle has made this determination stronger than ever. It means an expenditure of \$1,000,000 by the railroads of the city."

Improvements on Northwestern Roads.

We have more than once spoken of the good and wise work which is being done on many of the Northwestern roads in improving roadbeds and straightening curves, reducing grades and laying heavier steel.

Perhaps the most conspicuous work in this direction has been that done by the St. Paul, Minneapolis & Manitoba. In addition to the work which was done last year on the line between Fergus Falls and Evansville, and the building of the extra tracks between St. Paul and Minneapolis, the company has this year relaid, on the Breckenridge and Fergus Falls divisions, 300 miles of track with new 75-lb. steel rails, and the same heavy steel has been used on the new Montana Central line from Helena to Butte. The Northern Pacific has also during the last two years relocated a large amount of its track on the Idaho division, and is now laying new 66-lb. steel on the Eastern Minnesota division.

The St. Paul & Duluth has also been hard at work reducing its grades, last year by the short line into Duluth and last year and this by the work at Forest Hill, which, however, has been stopped by the change of policy of the new management at the time when it seems as if a comparatively small amount of additional work would be of very great benefit to the whole road. The same company has laid an extra track and has materially improved its roadbed between St. Paul and White Bear.

The Wisconsin Central line from Chicago to St. Paul has been immensely improved during the past 12 months, as also has the Chicago, St. Paul & Kansas City main line. The Chicago, Milwaukee & St. Paul, the Omaha with its rock ballast and the Burlington & Northern with its low grades, have already first-class lines between Chicago and the two cities.

In fact the northwestern roads are emerging with wonderful rapidity from the condition common to the majority of newly and rapidly laid western lines. During the last two years the change in the character of the roads has been almost more remarkable than the great additions to mileage. In the matter of rolling stock we believe it to be recognized by master mechanics and superintendents that some of the large northwestern systems are better equipped by far than the average of eastern roads, and in the condition of track and roadbed they are fast rivaling them.—*Northwestern Railroader.*

Southern Enterprise.

Atlanta is making street cars, built of Georgia wood, beautifully finished in Georgia ash, and artistically decorated. The iron, even to the bumper springs, is forged in Atlanta. The whole car, except a few pieces of fancy hardware and the perforated seats, is home made. Five of these have been made, and on each one there was a handsome profit in spite of the fact that they were made by hand in competition with the largest street-car companies in St. Louis, Philadelphia and New York. The freight on a street car from any of the large works to Atlanta, is \$75 to \$100, 20 to 25 per cent. of its value. It is now proposed to organize a company with sufficient capital to manufacture cars on a large scale.



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EDITORIAL ANNOUNCEMENTS.

Contributions.—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and in their management, particulars as to the business of railroads, and suggestions as to its improvement. Discussions of subjects pertaining to ALL DEPARTMENTS of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.

Advertisements.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns OUR OWN opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.

The interviews on the subject of continuous heating given in another column are chiefly noticeable as showing that the strongest prejudice against this method of heating is found among those who have not used it, and can therefore only guess at the result. Those who have used it, and can speak from actual experience, talk in a very different tone, and find that it possesses great advantages over both stoves and independent heaters, though the whole problem is new, and, as yet, imperfectly solved.

In this issue we give the conclusion of Mr. Thomson's paper on the lessons to be drawn from American bridge failures, lately read before the British Association. The first part was given in our issue of Sept. 28, and we shall make but little comment in addition to what was said then. In general, the author's conclusions as to the necessity for careful design, keeping in view the tremendous duty to be performed by modern bridges, will not be questioned. Nobody denies the fact that many iron railroad bridges now standing are too light for the rolling stock they have to carry, and the great expenditure of money the last year in replacing or strengthening iron bridges is evidence that engineers and railroad officers realize the changed conditions. The practice of using plate or attic girders for short spans is increasing also, and it has come to be well understood that short spans should be proportionately heavier and stronger than long ones, as the live load increases in comparison with the dead load. But the length of span at which the line is to be drawn between lattice and pin connected structures is not by any means settled. Few American engineers will agree with Mr. Thomson in putting it at 250 ft. Few will agree with him, too, in recommending buckle plate floors, ballasted, for short spans. In the discussion of this subject by the American Society of Civil Engineers at the summer meeting of 1887, two members expressed themselves in favor of such floors, and ten were decidedly against them. One was undecided. The chief objections raised were the increased liability to corrosion, and the inaccessibility of such floors for inspection and painting. It was generally held that a sufficiently strong floor could be secured without these great disadvantages, and one member suggested the use of ballast on creosoted timber, for short spans. A floor of this kind is of undoubted advantage in taking up the shock. One large bridge lately built has a floor of corrugated plates with ties laid in the corrugations. In this case the floor had to be put within two feet of high water, and the plate floor was used to give lateral stiffness to resist the impact of floating material that might come in contact with the bridge. Such a case is, however, very exceptional, and has no bearing on the question of span. The obvious lesson of the paper was stated by Mr. John A. Wilson, in the discussion referred to above, in these words: "While we have in

this country good bridging concerns who employ competent engineers and turn out only first-class work, there are undoubtedly others who need the closest professional oversight, from the very commencement, to secure good designs, good material and good workmanship."

One of the most serious collisions for many months occurred on the Baltimore & Ohio, near Dickerson's, Md., last Saturday night, though the loss of life was comparatively small (three trainmen killed and six injured), and no passengers were killed or even seriously injured. An east-bound freight was waiting on a siding for three west-bound passenger trains to pass. The trainmen fell asleep and awoke just as the second passenger train passed, and, assuming it to be the third, started along, only to meet the heavy express train in a cut on a curve where it was running at a high speed. The wreck is described as a terrible one, the forward cars in both trains being literally crushed to kindling wood. The trainmen are reported as saying that they had been on duty 36 hours. This, if true, would certainly throw some of the blame for the disaster upon the officers of the road, though how it could palliate the guilt of the conductor and engineer is hard to see. Any person fit for either position ought to realize that it would be better to remain on the side track 36 hours, or even 36 days, and get recuperated, than to make such a reckless move. The officers of the road, however, say that the men had been out only about 22 hours, with two intervals of three hours each for rest during that time, and that they had had long rests just before. While this would not be intolerable in an emergency, the officers certainly can feel no great complacency in offering such a statement as a defense. Such hours, if ordered, or even allowed, with any frequency, would not be creditable to any management.

A daily paper says that the "official inquiry" should enlighten the public on this case. The "official inquiry" will probably be conducted by an ordinary coroner's jury, which has no special fitness for such an investigation and no adequate means of impressing a lesson if one is discerned, and the findings of which are likely to be of no technical value. The lack of anything better than this, except in a very few states, is often apparent. Of a hundred of the most conscientious railroad officers in the land scarcely one would have the courage to impartially report a bad case of negligence involving even a slight degree of culpability on his own part. The necessity of an impartial and expert investigating authority, in such a public business as railroading is therefore patent. It should not be assumed that an impartial body—as a board of railroad commissioners—would be of value only to the public; its work would benefit the railroads also.

The *Equipment Guide* prints a list of 31 roads, most of them important ones, which have placed the distribution of cars and the keeping of car records in the hands of a single officer. On 21 of these the title indicates that the officer placed in charge is the same who formerly kept the accounts, merely. The efficient handling of freight cars is in many cases much impaired by the fact that the car accountant, who, having intimate knowledge of the records, and therefore of the actual conditions of the situation, can best arrange the desired movements, lacks authority. He must either give orders under his own name with more or less uncertainty as to the degree of obedience to be expected, or else get the signature of the superintendent, who, having a multitude of other things to look after, naturally fails to follow up every order as it should be followed. Constant attention to the car service department gives enthusiastic interest in it, and if the enthusiasm of the car-recorder can be combined with the authority of the superintendent, a distinct advantage is secured. It is impracticable to give the superintendent the knowledge of the car service agent, but the authority of the former can be imparted to the latter; at least within certain limits. The action of so many roads in the line indicated, and the approval by the Time Convention of the committee's recommendation to the same effect are, therefore, encouraging signs.

The meeting of the Time Convention this week was one of the most profitable in the history of the organization. The subjects that were considered are no more important than the train rules which have been the main topic before the Convention for the past few years, but some features of them are more susceptible of ready explanation and intelligent discussion than are the grammatical and technical intricacies of train rules, and therefore the meeting showed more satis-

factory progress. The report of the committee on car service and per diem rates, which we print in full, is a strong and able document, setting forth with clearness and brevity the large mass of facts which they have gathered by great labor.

The principal discussion was on the question of collecting from consignees a proper sum for the use of cars as store-houses. This subject is as important as the adjustment of rates for interchange; in fact, the two may be regarded as interdependent. Demurrage—or "trackage," as it seems necessary to call it in order to avoid the odium that attaches to the former word by reason of the decision of some judge that "demurrage" can apply only to water transportation—ought to stand on its merits; ought to be enforced because it is right, whatever may be the basis on which the car is hired by the terminal road; but as a system under which the outgo on a car increases in proportion to the time it is kept would be a strong lever to induce many managers to try to increase the income on the same car, per diem rates for interchange may be regarded as a necessary factor in any plan to regularly collect detention charges from consignees. On the other hand a per diem rate as between roads is absolutely essential to any rational treatment of interchange of freight cars, for the reason that time is so important an element in estimating their value; and it deserves to be adopted, however great may be the reluctance to support it by transferring the burden to the consignee. If all roads were to adopt the practice, alleged to have been indulged in to some extent already by roads using the per diem system, of deliberately paying out money to relieve consignees from paying for the use of cars, an interchange charge of 10, 15 or some other number of cents per day would still be essential to an equitable system. If the present average movement of cars were 50 miles a day instead of 25, the need of a change would still exist, for the earnings of a car standing still for twenty hours, or even ten hours, out of every 24 cannot be justly reckoned by mileage alone. The discussion, as will be seen by the report in another column, brought out a number of points in a clearer way than they have been presented before, and it is reasonable to expect that the interest and enthusiasm of many will have been quickened. If those who hope to see further progress shall be induced to make careful study of the reasons for the failure of the recent per diem movement, and to seek adequate remedies therefor a new advance may be accomplished. The diversity of views regarding the right amount per day to be charged to consignees should not be allowed to hinder this reform. As was well said at the Convention, the difference in value of land at various terminals may easily make a very large variation in the value of the room occupied by a car, but this variation can readily be calculated with sufficient accuracy for practical purposes, and rates fixed accordingly.

The proposal to change the name of the organization is eminently sensible. It has outgrown the old title, and will quite likely be found to have been insensibly hampered by it.

The letter concerning the breaking-in-two of trains which is printed in another column is from a trainman of experience, and has a certain interest for that reason. A good many superintendents give critical attention to the details of train work only when a smash-up is on the docket for investigation. If they, especially those who have seen service on freight trains themselves, would take more pains to look up their conductors' qualifications the bills for draw gear broken in collisions and worse things, might perhaps be reduced. Accidents that can be prevented by improved machinery are becoming less frequent—or at least are more readily preventable—than formerly, but the class which result from forgetfulness or incapacity of employés do not show so favorable a record. Prevention, therefore, must be sought in attention to the perfection of the men as well as in perfection of mechanical appliances. Trainmen like Langdon who have intelligent views and have the faith and ability to support them should be enabled to impart their common sense to less thoughtful and less systematic members of the corps.

The arguments for and against controlling trains at the rear end are doubtless simple. Those who believe in breaking at the front end think it better to prevent the braking of links and pins than to encourage such mishaps, simply because the time or place is favorable for discovering and correcting them. The theory is, that proper care at the front end will prevent all breakages; while the opposite view, admitting that breaking-in-two is more likely, must also admit that breaking-in-three is also more likely. And the latter

cannot be positively provided against in a dark night when the train is long and the crew small. Guard chains would be valuable, doubtless, but can hardly be said to be practicable under present conditions. The trouble with trains braked at the front often comes, however, when steam is put on at the foot of the hill. If the ascent then encountered is short, and followed again by a descent, the strain on some of the couplings is likely to be severe. Langdon's plan provides against this by keeping the train constantly pulled taut, however irregular the grade. As to how well this plan can be carried out with heavy trains, sudden and great changes of grade, and brakemen and conductors of only average ability, the evidence is not very clear. With careful engineers and lazy brakemen the other plan might be better, while with reversed conditions Langdon's way would be the better. As the air brake comes into use trains will naturally be held at the front end, as the cars so equipped will be grouped there in making up. This being the case, hand braking would perhaps best be done at the front for the sake of uniformity. Careful examination of couplings before starting and gentle handling of the regulator by the engineman should be enforced whatever method of braking is employed.

The Air Brake in Freight Service.

A foreigner of some distinction, who lately left America after a long visit and considerable study of the railroads of the United States, expressed his surprise that the air brake, which has come into universal use here on passenger trains, should not be more generally applied to our freight trains running long distances. His own explanation was that an efficient and reliable continuous brake for freight trains had not yet been made. If his assumption were true, that the continuous freight brake is not coming rapidly into use, his conclusion that there is a somewhat general want of confidence in it might be sound. Evidently his assumption was not true.

It is but little more than a year since the new quick-acting brake was finally adapted to the service of long trains. It is not quite a year since the journey through the country of a 50-car train demonstrated that the brake could handle such a train smoothly and reliably, in service stops and in emergencies, without shocks or failures, and could be depended upon to keep in good working order through long and fast runs. Yet, in the nine or ten months which have elapsed since that demonstration was completed, orders have been placed for nearly 17,000 sets of the new quick-acting brake. Indeed, it is possible that by to-day the number ordered has been increased to 18,000 or 19,000 sets. What proportion of these are for freight equipment is not stated; but doubtless much the larger part, for we hear of but few changes from the old to the new form of valve for passenger equipment. While these figures do not represent a great percentage of all of the freight equipment of the country, they do represent a great percentage of all the equipment that has been built since the new brake was brought out. In 1887 the cars in Great Britain fitted with continuous brakes were 37,462. Of these over 3,000 were equipped with chain brakes, or Fay's and Newall's brakes, which are hand brakes connected to work together on several vehicles. It is seen, therefore, that in 10 months or less the orders for the new freight brake in this country are near one-half of the whole air-brake equipment of Great Britain.

But of course this is not a measure of the actual number of automatic brakes in use on freight cars in the United States, although it does give some notion of the rate at which they are being put into use. In April, 1887, the Westinghouse Co. had 49,131 freight cars equipped in the United States and South America, and had in hand unfilled orders for over 8,000 sets. The extended application of the brake to freight cars began only in 1883. The American Co. had 5,000 freight cars equipped, and it is well known that the Eames was in considerable use on lines having but little interchange of cars, although no definite figures were obtained from that company. As the air-braked freight cars are absorbed into the great mass of the rolling stock, their number seems small and the progress of this improvement appears slow. Actually, however, we see that the number is great, and that the use of the brake extends very fast.

The greatest number of brakes ordered by any one road the last year is 4,700. Had our foreign inquirer extended his investigations a little further he would have found one road with about one-third of its freight stock equipped, or ordered to be equipped, with the new brake. We hear of several roads which order all new freight stock equipped with the air

brake, and of prominent officers recommending to their companies the immediate expenditure for this purpose of very large sums.

Considering how recently the air brake has been adapted to handling very long trains, we should say that it is coming into use not slowly, but wonderfully fast. For while the advantages to follow its use are great and are well understood, there are grave objections to its application to freight cars. The first and chief objection is, of course, the expense. The first cost is a serious consideration, but that is a certain sum which can be provided for. The cost of inspection and maintenance, however, is indeterminate in amount and is sure to be great, and it is this, we take it, more than any other consideration, which causes railroad officers to hesitate. They know too well that, as a Northwestern superintendent puts it, "a freight car has no father or mother." Experience as to the cost of maintenance of passenger brakes can apply only generally to freight service, as the conditions are so different. Yet this fact that proper provision must be made for the care of the brake is one that has to be faced. The use of the air brake in train service is sure to increase fast. In fact, we have seen with what rapidity it is coming. It is one of the inevitable things that cannot be long postponed, even if its postponement were more generally desired than it is. Yet the railroad companies should not take the brake without a knowledge of their own necessary responsibility for its working. That many of them will do so seems to be the danger in the present period in its history. Last fall the Westinghouse 50-car train made a journey of some 3,000 miles, often running at 50 miles an hour, and always at fair passenger speed, under a variety of conditions as to track and weather and over the severest grades east of the Rocky Mountains. At some eight or ten different places the train was stopped and put through a series of severe tests, the results of which are familiar to our readers. The exploit was a bold one and its success was brilliant. Throughout all of this extraordinary trial the brake worked so efficiently that its reliability was at once established, and, as we have said, the danger now is that railroad officers will expect too much of it—that they will forget the fact that, while the air brake is a machine of enormous capacity for usefulness, it is still a machine that cannot produce its best results unless it is systematically taken care of.

The experience of the 50-car train has doubtless encouraged this attitude, and there is further temptation to it in the fact that the number of cars fitted with the air brake is usually a small percentage of the total freight stock of a road, and consequently few air-braked cars will be run ordinarily in any one train. The result will be that the great economies to come from its use will not be realized at once, and the inclination will inevitably be to spend little on its care. Undoubtedly the makers of the brake realize all of these conditions better than any one else, and are trying to provide, by its careful construction, for the lack of the care which any other mechanism of like importance would receive from its users. Having done the best they can in that way, they must trust to the co-operation of the users. On those roads where the mechanical departments are in close relation with the management, and are influential in forming the policy of the road, the capacity and the limitations and needs of the brake are usually well understood, and proper provision will be made for its care. Or, if it cannot be properly cared for, due allowance will be made in estimating its performance. We may apprehend, however, that on roads not so organized the brake will be taken up as something to be put to work and left alone, and that complications and difficulties which may arise in its use will be charged up against it, and its progress eventually delayed, not by its inherent faults, but by the ignorance of its users.

The sum of the matter appears to be that a practicable, every-day freight brake is now made; that many railroads recognize this fact and are buying it; and that the problem now is to secure for it the proper care in use. To this end, of course, nothing will contribute so much as an actual demonstration of its value. When this is proved by experiment, and not alone by reason, the railroad companies will feel justified in incurring the necessary expense for its maintenance. An unfortunate feature of the situation is that some of the benefits to be derived from the use of the air brake on freight trains are of a nature to be realized only when its use is pretty nearly universal; and some of the greatest savings are such as can not be measured by precise figures. Amongst the latter will be included the less number of accidents. One great class of accidents, the break-in-two accidents, will be practically abolished, and col-

lisions will unquestionably be reduced in number and in effect. While every body recognizes this to be true, it will be quite impracticable to know what the saving is. The saving of life which will result from taking the brakemen off the tops of the cars will be an inestimable boon, and one which alone would seem to many a sufficient reason for the use of the automatic brake. The saving in the cost of overhead bridges, from the same cause, is another economy which, although sure to be important, will be slowly realized. It undoubtedly takes some intelligence and a good deal of courage to incur a large and inevitable expense which is constantly felt, to secure economies which cannot be shown under any definite ledger head; but it may as well be recognized at once that this expense has got to be met and that the economies are sure to come.

Ten Years of English Railroad Traffic.

The report of the Secretary of the Board of Trade in regard to the railroad companies of the United Kingdom furnishes us with some means of measuring the growth of English railroad traffic in recent years.

The mileage, of course, changes but little. In 1877 the United Kingdom had 17,077 miles of line open for traffic. In 1887 it had 19,578 miles, an increase of not quite 15 per cent. It is hardly necessary to say that this is due to the fact that England was already so well supplied with railroads at the beginning of this period as to need comparatively few additions. The traffic, and especially the passenger traffic, has grown much faster. The figures are as follows:

	1877.	1887.
Passengers carried.....	490,352,000	647,775,000
Passenger train-mileage.....	119,700,000	151,800,000
Tons carried.....	178,873,000	229,052,000
Freight train mileage.....	107,400,000	128,400,000

From this it appears that the freight train-mileage has increased not quite 20 per cent., while the tonnage has increased nearly 30 per cent. On the other hand, while the passenger train-mileage has increased 39 per cent., the number of passengers carried has only increased 32 per cent. In spite of the absence of ton and passenger mileage statistics we are warranted in assuming that the average freight train load has increased and the average passenger train load diminished during the period in question. We are also justified in the statement that the volume of traffic has, in a general way, increased 30 per cent., with an increase of only 15 per cent. in mileage open. This is quite a different showing from that in America, where the train-mileage and the volume of traffic increase little faster than the mileage of road. In other words, England is increasing the intensity of use of her roads, while we are increasing the extent of ours.

In matters of train economy England shows decided progress. The expenses per train-mile are less than two-thirds of ours. This comparison may mean very little, on account of the light trains in use in England. A more important fact is the reduction which has taken place in England itself. In 1867 the cost per train-mile in Great Britain was 35.82 pence; in 1887 it was 30.26 pence. Part of this decrease is due to the smaller share of maintenance charges, made possible by increased volume of traffic; but a fair share is due to economy in transportation expenses and in locomotive power.

It might be supposed that with increased traffic and diminished cost per train mile there would be a great increase of financial prosperity. This is not the case. In 1877 the proportion of net earnings to capital was 4.13 per cent.; in 1887 it was only 3.81 per cent. Let us see what were the reasons for this result.

With regard to freight, we find that in spite of the large increase in the tonnage, the receipts have only risen about 10 per cent. This is partly due to the larger proportion of low class freight—minerals now forming 72 per cent. of the total tonnage of the United Kingdom instead of 69, as in 1877; but it also indicates clearly a decided reduction in rates on goods of the same class. This is an interesting and important fact. If we compare the progress of events on the continent during the same period, where rates have remained stationary, or nearly so, we see the advantages of private over state railroad management, even in those cases where the former has been most severely criticised. The private company, even when it seems to have a monopoly, is compelled to make progress in serving the public, while the state itself is not.

In passenger traffic the falling off in receipts is equally marked, but more easy to explain in detail. It is chiefly due to the increased proportion of third class passengers. In 1877 they formed but four-fifths of the whole number; they now form seven-eighths. Since the English first-class fare is in round numbers

double that of the third class, this marks an enormous reduction in income. It should be said that this is not so much a change in the character of the traffic as a virtual reduction in rates. The competition of rival routes has caused such an improvement in third-class cars that they are now quite unlike those of a few years ago—much more like the old second class. On many of the systems the apparent change in the proportion of third class passengers has been accompanied by a gain instead of a loss of average comfort.

Under all these influences the receipts per train mile have fallen as follows:

	1877.	1887.
Passenger.....	\$1.15	\$0.96
Freight.....	1.51	1.39
General.....	1.32	1.15

Yet, in spite of these changes, such have been the improvement in traffic and economy, that the net earnings have been on the whole increasing. Even the net earnings per mile of line open are greater now than they were in 1877. The more unfavorable percentage of profits is due to changes in the capital account of the roads.

The total capital of the railroads of the United Kingdom amounted in 1877 to £374,000,000, or not quite \$3,300,000,000. In 1887 it had increased to about £546,000,000, or over \$4,100,000,000—an increase of 25 per cent., while the mileage had increased only 15 per cent. The railroads of the United Kingdom are now capitalized at over \$210,000 a mile. It is not probable that a fair estimate of the added investment would wholly account for this difference. It seems as if the English companies had carried to an unwarranted extent the policy of dividing all they earn. There is certainly no reason to suppose that an increase in the volume of traffic can be continued without further reductions in rates; and the experience of the last ten years shows clearly enough that the loss from such reductions will counterbalance the gain from increased traffic. To expand the capital account under these circumstances is to make further reductions of dividend inevitable.

Erecting Locomotives.

Our contemporary *Engineering* (London) is very indignant that the Pennsylvania should erect a locomotive in 16 hours and 50 minutes, and apparently considers that the *Railroad Gazette* is greatly to blame for having published engravings showing exactly how the feat was performed. *Engineering* states that the engine when completed was "resplendent with brass work and paint" and that "the incident is certainly more sensational and amusing than instructive." Our contemporary's ideas are so ludicrously incorrect that we must think they are derived from the tedious discussion which for some years has occupied its columns as to the relative merits of American and English locomotives, where those who knew nothing about locomotives exposed their ignorance for the benefit of those whose knowledge was a negative quantity, the editors being apparently unable to point out even the worst misstatements or indorse the few opinions of experienced men. Our contemporary apparently knows as little about the locomotives of either country as the majority of its correspondents. The fact that American locomotives, with very few exceptions, have been for many years divested of every ounce of unnecessary brass work and are painted uniformly in black, surely the soberest of colors, has evidently not yet reached the journal once edited by our countryman, Zerah Colburn, the most original, fertile and suggestive writer on locomotives and kindred mechanical matters whom this or any other country has ever produced. The most amusing side perhaps of our contemporary's attack is the ignorance it betrays of the fact that a very similar feat in erecting had been performed a few months before in the largest and best known shops of the largest and best known English railroad. If the Pennsylvania has been wasting money in making a sensation, the London & Northwestern is even more to blame, but Crewe is generally considered to be devoted to building a good locomotive at the least possible cost rather than to sensationalism, and no one who has even the most superficial acquaintance with the ways and methods of the Pennsylvania will accuse the magnificent staff of that company of posing for sensational effects. On the contrary, a habit of doing everything in the best possible manner has given that railroad a unique position, for no other line in any country is so unanimously awarded the palm of superiority, not only by the general public, who are not always the best judges, but by neighboring roads.

A shop habituated to turn out work with extraor-

dinary rapidity becomes extremely useful when an emergency arises, and it is of the utmost importance to repair a break-down promptly, or renew plant with the minimum interruption to traffic. Such emergencies arise unexpectedly on the best equipped roads. Even on the London & Northwestern, the energetic management and good equipment of the locomotive works proved very useful when a washed out bridge was replaced in steel in a few hours, and many similar instances have occurred in this country.

The writer in *Engineering* appears to imagine that in erecting the Pennsylvania engine, the division of work between the frame shop and the erecting shop was solely for the purpose of shortening the time of actual erection and so achieving a sensational effect. The division of labor, however, is founded on no such absurd reason. It is obvious that an efficient erecting shop has to be furnished with traveling cranes, and thicker and higher walls than are necessary in an ordinary machine shop. The erecting shop is consequently far more expensive for the floor space provided, and it is, therefore, economy to do as much as possible of the work on the frames in a special frame shop, where lighter and, therefore, cheaper cranes are sufficient, and where, moreover, the men doing little else, become more expert. This subdivision of labor exists more or less in most locomotive shops, and we believe is increasing on both sides of the water. The difference in practice between Crewe and Altoona is possibly partly due to the fact that the former shop is situated on a plain, where extension is easy and building materials are cheap, while Altoona is situated in a deep valley and space is valuable, the present locomotive shops being hemmed in by high hills on either side.

A very similar difference of practice, however, exists in many shops as regards boilers, though the desire to gain notoriety has not been alleged against those shops in which the boiler is merely riveted together in the boiler shop proper, the fire-box being put in, the stay-holes tapped and the stays screwed in, the flues expanded and the mountings attached in a distinct shop. All these operations are, however, conducted in one shop by some of the largest locomotive building firms, and the difference in practice is probably chiefly due to local considerations. In some cases, when business outgrows the old shop, it is more convenient to build a distinct boiler mounting shop than to enlarge the original boiler shop, and hence the latter is henceforth devoted solely to marking off, shearing, planing, punching, flanging and bending the plates and turning out the resultant shell when riveted together. The manner in which the work of building a locomotive may be subdivided admits, however, of endless modifications, especially in railroad shops where repairs are of great relative importance and occupy most of the space, though the new work generally keeps the heavy machines busy. It frequently happens that as the road grows some particular shop which cannot be enlarged becomes too small for the work, which consequently must be arranged and distributed afresh, so that no one department or shop falls behind.

Difficulties of this kind are not always unmixed evils, for as necessity is the mother of invention, so these enforced alterations in established methods are often the means of introducing valuable improvements. A case in point occurred some years ago, in the writer's experience. The erecting shop could not be enlarged and was greatly overcrowded. It was found that many of the engines were waiting for new boilers or for heavy repairs to the boilers, and it was determined to prevent this by building new standard boilers complete, for stock. The standard boiler was designed to fit several different classes of engines, and thereafter the old boiler was taken out of the engine requiring repairs and promptly replaced by a new boiler taken out of the stock in store. Meanwhile the old boiler was repaired in due course and sent into the store ready for another engine. This system is of course followed now on many large roads and applied to nearly all parts of a locomotive, but the convenience and saving of time in repairing due to interchangeable parts is perhaps nowhere more strongly felt than with standard boilers, which will readily fit any one of several different classes of engines.

The principle can be further applied to tenders, and on many large lines it is now customary to have a smaller number of tenders than engines. The spectacle of numerous tenders waiting outside a shop while the locomotives to which they belong are undergoing repairs had been seen by railroad men for years before some one had the common sense to suggest a simple method of saving the unnecessary outlay and consequent loss of interest on idle plant. Even

our contemporary, *Engineering*, would hardly consider it "sensational" or "amusing" to make 90 tenders running and 5 under repair suffice for 90 locomotives running and 10 under repair, where the traditional method would be to have the full 100 tenders, 5 of which would be always idle, waiting uselessly and blocking the sidings. This economy is, however, on all fours with the division of labor between the frame and erecting shops. Instead of building the engine complete in one lofty shop, as much as possible of the preliminary work on the frames is done in the smaller and less expensive frame-shop, thus saving, as in the case of the tenders, an unnecessary outlay on plant which cannot be fully utilized.

This principle is one of the most important in conducting modern industrial enterprises, and is fully recognized in the practice of the most successful capitalists and engineers. While devoting this much space to the material side of the question of the feat of the speedy erection of the Pennsylvania and London & Northwestern engines, it must not be forgotten that all such feats have a strong moral effect and stir up a spirit of emulation to still further surpass former efforts and beat the record. And in this endeavor, new methods of quickening and facilitating work are discovered, and thus progress leads to further progress, and so the race goes on to further improvements and higher civilization despite the sneers of those, who awakening from slumber, suddenly become aware that the world does move.

Station Transfers.

A correspondent sends us the following comments upon a legal point referred to last week. This is a matter of detail, and concerns points which the traffic manager, overburdened with traffic agreements and perplexed with rate wars, can personally give little attention to; but it affects revenue, and is therefore worth the attention of some department other than that of the counsel. There the chief question must be whether a fight or a compromise will be the more profitable. Lawyers can only study to cure the evil; but the freight department might prevent it. Capt. Fleming's remarks, printed in our last issue, have a bearing here.

"The case of *Waite vs. the N. Y. C. & H. R.*, reported in your legal column last week, calls up the subject of transfers of cars and manifests between connecting roads. In the *Waite* case a B. & A. platform car left Boston with part load for Little Falls, N. Y., and part for East St. Louis. As an order had been issued forbidding the running of a B. & A. platform car beyond its own line, the freight in question was transferred to a N. Y. C. & H. R. car, the original card and running slip being changed also. It was the custom for Boston station to use through cards and slips for cars when loaded directly from Boston to Western points, but happening to have machinery for a New York point, and also for a Western point which could not be got into a box car, that station put both lots upon the one car (contrary to custom), and then issued cars and running slip to Albany only, to avoid the very thing which afterwards happened. Two separate kinds of billing were also issued: one a joint manifest from Boston to Little Falls and one a through Merchants' Dispatch manifest, Boston to East St. Louis. These were mailed from Boston on separate trains, and were carried by messengers (after entry by B. & A.) to the N. Y. C. & H. R. office on separate trips. When the car was transferred a notice of such shifting was sent by the B. & A. to the N. Y. C. & H. R. containing the words 'St. Louis' only. Meantime the car had reached the N. Y. C. & H. R. yard, and not being carded to any point, the men in charge (not looking beyond the destination 'St. Louis' on the notice) failed to see that the car contained a Little Falls boiler, and failed also to see upon their records that the car was billed to Little Falls as well as St. Louis, and so sent the car to St. Louis. Meanwhile, anticipating the arrival of the boiler, the Little Falls consignee stopped his factory and took out his old boiler. On the trial the Court allowed him all his losses from the day when the boiler should have arrived till its final appearance back, amounting to about twice the original value of the boiler. This verdict is sustained by the Court of Appeals.

"If we allow that the Boston & Albany was at fault in leading up to the error, the question was, was error enough shown on the part of the New York Central & Hudson River to warrant a verdict? To this must be answered, yes. It is a rule in railroading that the order for the forwarding of any freight by a connecting road is the manifest, and any other order or notice must be interpreted by that manifest. No mere notice of transfer, whether it had the names of fifty cities or of none, could excuse this carrier from checking his own records, to be sure that he had picked out every way-bill to which the notice applied. In this case the fact that car had no through cards or running slip (contrary to custom) should at once have put him on his guard. The judge says 'it was fairly a question for the jury whether the defendant was not negligent in shutting its eyes to its own means of knowledge, which it was its duty and business to utilize and employ. If the system of transfers adopted admits of such mistakes, both roads should reorganize the system.'

"In this last sentence the Court of Appeals utters a sound transportation maxim. The fact is that systems of through billing, through loading, through carding, etc., are devised—for one thing—expressly to avoid delays at connecting points,

and to accomplish this it is absolutely necessary that the directions as to route, destination, etc., given under the system should be respected without consultation of original documents at every turn. And if from any cause it is necessary to depart from the usual custom and rules, every precaution should be taken to see that the exceptions are clearly understood. In the case before us the Little Falls and the St. Louis way bills should each have had a full statement that the car had other freight on it, and that it was not a customary through car. The moral is that every departure from a *modus vivendi* at a connecting station where large traffic is handled should be accompanied by plenty of warnings, and that such exceptions should be as few as possible."

Annual Reports.

Nashville, Chattanooga & St. Louis.—The following are the results for two years past:

	Year ending June 30, 1888.	Year ending June 30, 1887.
Miles operated	650	592 1/2
Gross earnings—Freight	\$2,102,953	\$1,894,715
Passengers	834,283	725,960
Total, including miscellaneous	3,001,653	2,774,248
Operating expenses	1,770,248	1,578,611
Net earnings	1,231,405	1,195,637
Interest and taxes	769,834	709,834
Improvements	145,015	119,479
Dividends	298,741	298,741
Surplus	148,814	99,542

The capital account has been increased some \$3,000,000 since the last report. The account of cash received and expended is unbalanced, and, in fact, cannot readily be made to balance. The discrepancy is not great, and is undoubtedly due to loose methods of reporting, rather than to any more serious cause. The general capital account is as follows:

Stock	\$3,938,575
Funded debt	12,307,600
Floating debt	249,221
Current liabilities	357,400
Surplus	2,037,900
	\$21,840,096

But here again the increase of surplus shows a discrepancy of over \$100,000, as compared with the statements in the report.

The earnings of the main line, both gross and net, are greater than ever before. Specially conspicuous is the figure of earnings per train mile—\$1.60 $\frac{1}{2}$ —which shows a slight advance over the previous year, in spite of the fact that ton mileage rates have fallen a trifle. The passenger statistics of last year are not so arranged as to enable us readily to make comparisons under this head. Any criticism of the results of operations is impossible, owing to the fact that we are given no details as to the different items of operating expenses.

Cincinnati, Indianapolis, St. Louis & Chicago.

	Year ending June 30, 1888.	Year ending June 30, 1887.
Miles operated	302 1/2	30 3/4
Earnings, passenger	\$701,015	\$773,145
" Freight	1,707,221	1,754,830
Total, incl. misc.	2,797,670	2,752,882
Operating expenses	1,658,158	1,641,611
Taxes	64,090	58,984
Net earnings	1,075,421	1,052,296
Interest, etc.	519,211	658,848
Dividends	500,000	332,500
Surplus	57,811	60,947

* A slight discrepancy results from taking these figures from two separate accounts.

Capital account is as follows:

Stock	\$10,000,000
Bonds	9,073,750
Current debt	365,054
Surplus	247,647
	\$19,686,451

The apparent surplus of the company has been much reduced by the method in which additional stock was issued a year ago; over a million dollars being extra credits allowed to the subscribers.

The actual mileage was somewhat greater than the figures given, but is not all included in the accounts.

The increase of net earnings over last year is more apparent than real, so much having been saved in the items of maintenance of way. Transportation expenses have increased, partly from higher wages paid, partly from higher cost of fuel, and partly from certain traffic changes which increased the proportion of empty cars hauled. The report speaks of the Inter-state Commerce law as having a most unfavorable influence on the business of the road.

The passenger earnings, compared with last year, show an increase of \$20,869.02, or 2 $\frac{1}{2}$ per cent.

The number of passengers carried was	1,122,831
The same for preceding year	962,331

Increase, 16.68 per cent., or..... 160,500

The number of passengers carried one mile was	39,341,433
The same for last year	33,778,236

Increase, 16.47 per cent., or..... 5,563,197

The rate received per passenger per mile was 2 $\frac{1}{2}$ cents, against 2 $\frac{1}{2}$ cents last year, a decrease of 11 $\frac{1}{2}$ per cent.

The average distance traveled by each passenger was 35 $\frac{1}{2}$ miles, against 35 $\frac{1}{2}$ miles the preceding year, a decrease of 1 $\frac{1}{2}$ per cent.

The freight earnings decreased \$17,608.67, or 2 $\frac{1}{2}$ per cent.

The number of tons of freight carried was	1,705,293
The amount carried in the preceding year	1,719,705

Decrease, .84 per cent., or..... 14,412

The movement of tons of freight carried one mile was	209,378,861
The same for last year	207,70,702

Increase, 1.01 per cent., or..... 2,108,099

The rate received per ton per mile was $\frac{1}{2}$ cents, against

$\frac{1}{2}$ cents in the previous year, showing a decrease of 24 $\frac{1}{2}$ per cent.

The through passenger trains earned an average of \$1.80 per mile run; commutation, 87 cents; specials, \$1.24, and branch, 40 cents. Freight trains earned \$1.92 per mile run.

The annual inspection of the roadway of the Boston & Albany has just been completed. The high standard of excellence attained on this road is well known to our readers. This inspection, the general features of which our readers are somewhat familiar with, consists of two parts: First the careful examination by the roadmasters and other officials from an observation car placed at the head of the train in front of the engine. Each section is marked on a scale of 10 for the relative condition of its alignment, grade, frogs and switches, surface and ditches (and the other elements which go to make up a perfect road); second, the work of Mr. Dudley's dynamograph car. This is properly divided into two parts: The marking of the track at any desired limit of undulation; and the diagrams on a horizontal scale of 50 ft. to the inch of the surface of the rails, the width of the gauge, elevation of outer rail on curves, etc., as they actually exist.

The markers were set (as last year) at $\frac{1}{2}$ in. for the main line, and a little higher for the branches; that is, a depression in the track of $\frac{1}{2}$ in. in an 11 ft. wheel base will be marked on the diagrams. All the undulations, whether sufficiently great to be marked or not, are summed up and recorded on the diagrams for every mile of track.

The importance and advantage of these diagrams is not at first appreciated, as many of their valuable properties only became apparent after long experience in their interpretation and a critical study of their indications. A study of the diagram, while walking over the section of track to which it belongs, is most useful in training the eye to properly understand their meaning. When this faculty has been acquired, it is astonishing what a fund of information they contain. Not only are the defects of each particular rail made apparent, but the character, and often the cause can also be determined. It was also made evident, for the first time, from these diagrams, that a rough track is not always due to neglect of the trackmen, but is sometimes caused by defects in the rails as they come from the mill. Some of these can be gradually eliminated by the patient labor of the trackmen extended over several years, but others can be reduced only to a certain minimum. The diagrams also show the gradual deterioration of the track due to the wear of the rails and the various degrees of smoothness which it is possible to obtain with rails of different weights and different character of the traffic over them, as well as the effect of much or little labor spent on the surfacing of the track. Railroads are gradually coming to better appreciate the importance of these studies and availing themselves more and more of the information they furnish. Probably no other one thing has done so much to improve several of the prominent roads which have used the dynamograph car, as the intelligent study and well directed effort toward improvement in the directions indicated as most deficient by the diagrams. The Boston & Albany has built a marking truck of its own, and will hereafter make regular use of it in its track work.

There are one hundred and fifty thousand miles of railway in the United States; three hundred thousand miles of rails—in length enough to make twelve steel girdles round the earth's circumference. This enormous length of rail is wonderful—we do not really grasp its significance. But the rail itself, the little section of steel, is an engineering feat. The change of its form from the curious and clumsy iron pear-head of thirty years ago to the present refined section of steel is a scientific development. It is now a beam whose every dimension and curve and angle are exactly suited to the tremendous work it has to do. The loads it carries are enormous, the blows it receives are heavy and constant, but it carries the loads and bears the blows and does its duty. The locomotive and the modern passenger and freight cars are great achievements, and so is the little rail which carries them all.—*Iron.*

It is quite true that the "little rail" stands a terrible amount of punishment, but is not our contemporary a little too enthusiastic about the present refined section? Is not the "curious and clumsy pear-head," after all the more scientific? A good many people think that it approaches nearer to the correct section than the type now almost universal, and that when the joint is designed for the rail and the rail is not modified to suit the joint there will be a reversion to something between the pear-head and the modern sections. An increase of the radii of the lower corner and of the fillets would give a section adapted to colder rolling and probably less liable to internal strains. And if the sides of the head are drawn in, instead of sloped outward, at least as good a disposition of the metal, both for wear and for stiffness, can be made as with the present sections.

The New York State Railroad Commissioners have made a report on the side collision at Sixty-fourth street, on the Ninth avenue line of the New York elevated road, Sept. 26. It appears that the empty train was pulling out of the side track (not backing in) and that the engineer of the loaded train failed to keep a good lookout for the signal light which was placed at the fouling point and plainly showed red. The engineer claimed that his attention was attracted by an unusual noise in the engine, but there seems to be no evidence concerning the fireman's whereabouts or occupation at the moment. The Commissioners make no recommendation except that the road should employ as engineers none but careful men of good character. It will be remembered that the British Board of Trade Inspectors in precisely similar cases censured the fireman. It is, unfortunately, a fact that "men of known good character and careful habits" commit these blunders occasionally and probably always will. The safety

of trains on busy roads demands that the carefulness of their habits—or the habitualness of their carefulness—be reinforced by some constant, or at least frequent, monitor. The fireman should be held to strict accountability for keeping a lookout as far as it is reasonable to so require.

It has been the custom on German railroads to put up signboards at the changes of grade, showing the rate of grade and the length each way from the post. *Glaser's Annalen* states that 10 years ago 90 per cent. of these were arranged for reading only in passing, but a change in the practice has now taken place by which the signboards of 54 per cent. of the existing roads are arranged so that the grade of the approaching stretch of road can be read some distance in advance. An attempt has been made to light these at night, but the illumination has not proved sufficient to be of much use. These signboards suggest an improvement which might be made in the mile posts of many of our roads at a saving of expense. This is, instead of using a square post with the mile number on one face, or on two quartering faces with the posts set diagonally, which is an improvement on the single number: to use a triangular post taking just half the timber, painting the numbers on the two sides next the right angle, and turning the wide side of the post away from the track and parallel to it.

The Time Convention.

The fall meeting of the General Time Convention was held at the Hoffman House, New York City, on Wednesday of this week, about 75 members being present. The date fixed for the change of time-tables was Nov. 11. The first business before the convention was the

REPORT OF COMMITTEE ON CAR MILEAGE AND PER DIEM RATES.

In accordance with the instructions of the Convention at its last meeting, copies of the report then submitted have been furnished to the officers of every railroad in the United States and Canada, with a request for their views on the subject in hand. In reply, the chairman of the Committee has received a number of communications, most of which indicate a desire to agree on some form of combined per diem and mileage rate for the settlement of car service, the greatest obstacle being considered the lack of uniform action on the part of lines operating in the same territory and a lack of a uniform system of collecting demurrage.

We submit a statement of the loss and gain in car service balances and average mileage per day of freight cars by the roads operating under the mixed plan for the three months ending April 30, 1888. These statements are affected by the fact that they cover the period when the traffic on Eastern roads was interrupted by the great storm of March, 1888. Notwithstanding this the general average of performance on the roads reporting for these three months was 81 $\frac{1}{2}$ miles per day. Statistics collected by the committee of the Car Accountants' Association submitted herewith show an average performance of 24 $\frac{1}{2}$ miles per car per day of 47 different roads, which may be taken as the fair average mileage of all cars in this country. A comparison of these two statements shows an average increase of 7 miles per day in favor of the mixed plan, which may fairly be taken as one result of the adoption of the per diem and mileage system upon the roads which were working under that plan. That this may be fairly taken as due to the per diem and mileage system is further shown by the fact that a comparison of the mileage made by cars on six trunk lines in May, 1887, under the old plan with that of April, 1888, under the new plan, shows a similar percentage of increase.

An increase of 7 miles per day if applied to the entire equipment of these 22 roads is equivalent to an addition to their rolling stock of about 100,000 cars. The interest on the cost of this additional equipment would be about equal to \$10,000 per day of actual service. The Committee, after full consideration of the correspondence and the statistics gathered, sees no sufficient reason for modifying the recommendation already made by it in its report submitted at the last meeting, excepting, however, that in the matter of demurrage it desires to change the amount previously recommended from 50 cents to \$1 per day.

It will be noticed that the report of the Committee of the Car Accountants' Association herewith submitted states that the proposed rate of one-half cent per mile and 15 cents per day is too high, and suggests that the rate be changed to one-half cent per mile and 10 cents per day. This change involves simply the question of what is a fair interest on the cost of a car, the rate of 15 cents being about eleven per cent. on a valuation of \$500. Your Committee is still of the opinion that this is no more than a fair amount to exact, considering the short life and non continuous use of the car. Should it appear, however, that a slight reduction in the per diem charge would result in the more immediate adoption of this plan by a considerable proportion of the railroads of the country, your Committee would not urge any objections, believing that the plan proposed is a step in the right direction, and that the principle involved is of more value than the particular amount fixed in carrying it into execution.

Your Committee was further requested to take up the subject of the handling of freight cars and to recommend organizations and methods through which more efficient service can be secured. On this we recommend:

1st. That the distribution and movement of and accounting for cars should all be placed under the control of the transportation department, and, as far as practicable, under a single head. 2d. That the distribution of cars on divisions should be under the control of the division superintendent. 3d.

That a complete system of daily reports should be made in detail to the division superintendents, showing all cars loaded and empty, and full information in regard thereto on each division. This information, in condensed form, to be reported to the General Superintendent or other designated officer. Your Committee refrains from undertaking to submit forms in detail, recognizing as it does that what would meet the requirements of one line could not be suitable for another.

In the organization of the car accountant's office your Committee would especially recommend that full records be there kept of the daily movement of all cars on the line. This information will be found by all roads to be of the greatest value in hastening the movement of cars, thus tending directly to economy in their service. It is especially essential to any road adopting the per diem and mileage system.

Respectfully submitted,

THEO. VOORHEES,
P. P. WRIGHT,
S. M. PREVOST,
H. F. ROYCE,
C. H. PLATT,
Committee.

The communication of the Committee of the International Association of Car Accountants is as follows:

* * * "The statistics show that the cars owned by the 47 roads while on other lines made an average performance of 24.7 miles per car per day, which at three-quarters cent per mile amounts to only 18.5 cents per car per day. At one-half cent per mile and 15 cents per day the earnings would have increased to 27.3 cents per car per day. We therefore believe, in the light of more complete information as to the earnings of cars at the present time at three-quarters cent per mile, that the proposed rate of one-half cent per mile and 15 cents per day is too high. The tendency of rate for transportation is to a lower basis, and the roads which now pay a car service balance under the $\frac{3}{4}$ cent rate, and they are many, can with a good deal of reason object to any system that promises to increase their debit balance. The small performance of our cars shown under the $\frac{3}{4}$ cent per mile system leaves no question about the necessity for reform. Practical car service men everywhere believe that the adoption of the per diem system would lead to better administrative conduct of the car service departments of all roads, surely resulting in much larger car performance.

"It would, therefore, seem wise to fix the rate at a figure about equal to the $\frac{3}{4}$ cent rate under present performances say $\frac{1}{2}$ cent per mile and 10 cents per day, as a concession to the car borrowers. It is conceded that 22 cents per day for the use of freight cars is an inadequate return to the car owner, but the amount will increase as the performance of cars increases.

"We would especially commend the mixed plan in preference to a straight per diem plan, and that the mileage rate be not less than $\frac{1}{2}$ cent per mile. Straight per diem is not an equitable basis for car service settlements between different roads. This fact is demonstrated by an analysis of the large credit balances shown by the statement above referred to, that would accrue to the Pennsylvania; Erie; West Shore, Cincinnati, New Orleans & Texas Pacific; Pittsburgh, Cincinnati & St. Louis, and other long lines under a straight per diem charge of 25 cents. It will be observed that the principal cause for such results is the much larger performance of foreign cars on the lines of these companies than of their cars on foreign roads, and the great inequality of service here shown demonstrates that a straight per diem charge could not fairly apply.

"Rates of transportation are almost universally based on distance and terminal charges. Why should not car service rates be upon a similar basis? The performance of a car represents its utility or revenue to the company using it, and also its depreciation in value, through wear and tear, to the company owning it."

W. G. WATTSON, West Shore.
G. K. COOKE, N. Y., L. E. & W.
D. F. MARONEY, Baltimore & Ohio.
C. J. FELLOWS, C., C., C. & I.
R. PECKHAM, N., N. & M. V.
C. H. CANNON, St. P., M. & M.

Committee on Per Diem.

In the discussion on this report the various recommendations of the Committee were taken up, one at a time, the first part considered being that in which the Committee reiterates its recommendations made at the last meeting, the paragraphs of the report rendered at that time being taken up seriatim.

DEMURRAGE.

This question brought out the most general and animated discussion of any topic before the convention. The Committee on Car Mileage and Per Diem Rates made a change in its previous report by the recommendation that the charge for demurrage be one dollar per car per day after 48 hours from time of delivery of cars on track for loading or unloading, not including Sundays or legal holidays, instead of 50 cents.

This change, as explained by the Committee, was the result of more intelligent information as to the value of track room and the cost of switching service in different sections of the country. It was argued that many roads were already collecting demurrage charges at one dollar per day, which they considered a just and proper charge for the facilities granted, and if the Time Convention should go on record as prescribing fifty cents as a proper rate, the case of any road charging one dollar would be greatly prejudiced in any court by citing the action taken by the Convention. A particular case in point is that of the New York & England, which, as is well known, has for some time past been collecting a demurrage

charge of 75 cents after 48 hours and one dollar after five days. Mr. Platt, of that road, thought these rates were fair, and as his company had instituted suits against several consignees for demurrage charges at these rates, he thought these cases would be prejudiced by the action of the Convention should it recommend a rate lower than the one they had adopted for their line, and which is commensurate with the conditions of their service.

Mr. E. B. HILL, Manager of the Clearing House Association of New England, was given the courtesy of the floor, and spoke at some length descriptive of the reforms in the methods of handling and accounting for service of foreign cars reaching the New England states since the inauguration of the Clearing House about eleven years ago. This was preliminary to a suggestion that the business of collecting demurrage charges could best be entrusted to a bureau organized on a plan similar to that of his association. This bureau to attend to the application and collection of the demurrage charges under a general rule, and return the money to the owners of the cars on which collected.

Mr. ROYCE (C., R. I. & P.) said he was fully in accord with the views expressed by Mr. Hill, and believed such a bureau in operation would be productive of good results. He did not, however, favor returning the money collected for demurrage to the car owner, as the charge was not made for the use of the car, but for the use of the track the car occupied, and was more properly termed a trackage charge than a demurrage charge. The car owner obtained pay for the use of the car at the established rates for car service, but the money collected in the interest of hurrying the car back to its owners he thought properly belonged to the company making the collection. Mr. Royce referred to recent action of roads centering at Chicago having in view the establishing of a demurrage bureau in that city.

Mr. WADE (Wabash) stated that about a week ago a meeting of the representatives of 21 Chicago roads was held, at which it was agreed to inaugurate a demurrage bureau, somewhat similar to that at Omaha, having for its object the collection of demurrage or charges for trackage on all cars unreasonably detained in the city of Chicago or at points within a distance of 20 miles thereof. The details for putting the plan into operation were not fully determined upon as yet, nor the rates to be charged, but the general idea was to have one man in charge of the bureau who would collect information as to actual detention of all cars on the roads subscribing to the plan within the prescribed limits, and make his collections uniformly and in exact accordance with the agreed rates, not knowing one company from another. Matters had reached such a point in Chicago that something must of necessity be done.

Mr. E. B. THOMAS (N. Y., L. E. & W.) thought this was a most important question, very far reaching in its effects, and that the Convention should proceed with great caution to the adoption of any measures that could not be put into practical operation. He referred to the cases of over-shipment, where a dealer having facilities for unloading one car per day is shipped 10 cars together, and the delay in unloading the nine cars being a matter for which the consignee is not responsible. Also to rail and lake shipments delayed waiting the arrival of boats detained by storm or unfavorable winds. Mr. Thomas also thought the one dollar rate rather too high, and that fixing a high rate to admit of a scaling system of charges by different roads would be found objectionable, particularly at competitive points, where one company would collect a high rate and the other a low rate, naturally resulting to the disadvantage of the latter in holding its business.

Mr. PLATT (N. Y. & N. E.) replied that about all the conditions referred to by Mr. Thomas obtained on his line, yet they collected demurrage uniformly and with good results. The consignee having facilities for one car and receiving 10 cars was charged demurrage, and thereafter he made it his business to see that his orders were not overshipped. His company had at first been threatened with great loss of business at competitive points if the collection of demurrage was insisted upon, and many of their shippers did leave them but had latterly come back, stating they had reached the conclusion that the new plan was more to their interest than the old, in that they had discovered that they could get their cars placed for unloading promptly and just when they wanted them. At stations where 150 cars used to be held loaded every day, the number is now reduced to 50, and at one station switching engine and crew have been dispensed with, though the road is doing a larger business than ever before. Rates of demurrage charges at competitive points should be subject to agreement between the roads interested.

Mr. BRADLEY (West Shore) stated that his company would like to hire side track room on Manhattan Island for one hundred cars even at the rate of two dollars per car per day, and he thought the rate recommended by the committee was low enough.

After some further discussion of a general character, this portion of the report of the Committee was adopted unanimously and without change, to be further considered at the next meeting.

After a recess for lunch, the meeting took up the recommendation of the Committee that the Convention adopt the plan of mixed mileage and per diem rates as embodied in the rules which were formulated by the Car Service Association and which constituted substantially the plan employed by the "per diem roads" in the experimental use of the mixed system during the past year. A motion was made that the Convention accept this portion of the report of the Committee and express its approval of the general principle of a mixed mileage and per diem plan of set-

ting for the interchange of cars, but that the whole matter be referred back to the Committee, with instruction to make further investigation, gather more information concerning the details of putting the plan into execution, and report recommendations as to the best methods of so doing. After some discussion, in which the views of the short terminal roads—the borrowers—were briefly presented, this motion was carried. There was no explanation of the reasons actuating those roads which have tried the mixed system during the past year and abandoned it, and very little argument for or against the system, the prevailing opinion apparently being that further detailed information concerning the obstacles in various sections of the country should be gathered by the Committee before action by the Convention.

The Committee's recommendation of a rate of \$5 a day for passenger cars and \$3 a day for baggage cars when lent by one road to another on other than a mileage basis was adopted. There was some discussion concerning a proposal to omit the paragraph providing for a mileage charge for hauling to and from the point of delivery by the lending road, but as the report of the Committee specially provides that the rates named are to be considered only as bases to be used by roads mutually agreeing to them and all transactions are to be subject to agreement, the paragraph was adopted as it originally stood. The rule recommended by the Committee concerning improper routing of foreign freight cars was adopted as printed in the proceedings of the last meeting, viz., that foreign cars may be loaded only towards the home road, and should not be moved, empty or loaded, in any other direction without permission of the owner. The motion to adopt a rule providing a penalty for violations of the foregoing rule was lost.

The recommendations of the Committee concerning organizations and methods for the more efficient conduct of the car service office were adopted as printed in the report above.

The Committee on Train Rules made a report, giving statistics of the roads using the uniform code. It has already been adopted by roads controlling about 30,000 miles; and enough others have announced their intention to adopt it at an early day to make the total number of miles of road now committed to the use of the code about 49,000, owned by 79 different companies. The Committee is confident that this mileage will soon be increased to an amount equal to a majority of that represented in the Convention, if not a majority of the roads in the country. The report suggested the desirability of preparing a set of official diagrams showing the position of flag and lamp signals on engines and cars in accordance with the rules of the standard code, and the meeting instructed the secretary to prepare such diagrams under the direction of the Train Rule Committee. The Committee reiterated the recommendation adopted by the Convention at the last meeting that all roads using the uniform code adhere strictly to the authorized numbers attached to the rules, all amendments or alterations to be embodied in supplementary rules, printed directly under the standard, as 19a, 19b, etc. The Committee strongly deprecates any departure from this principle and affirms its conviction that the alterations made in the phraseology of certain rules by many roads are mostly unnecessary and likely to lead to confusion.

The Committee on Transmission of Accurate Time announced that the United States Naval Observatory at Washington had made arrangements with the Western Union Telegraph Co., by which standard time would be transmitted free to any road applying to the telegraph company. Commander Brown, of the Observatory, is willing to furnish the time daily at any hour selected by any road between 10 a. m. and midnight. This Committee placed before the Convention a letter from Mr. C. K. Giles, of Chicago, setting forth the advantages of watch inspection.

The report of the Executive Committee made a number of recommendations concerning the rules of order of the Association, and in accordance with the instructions given at the last meeting proposed that the name of the organization be changed to the "American Railway Association." These recommendations lie over, under the rule, until the Spring meeting.

The meeting passed resolutions of condolence on the death of Henry Monett, General Passenger Agent of the New York Central.

TECHNICAL.

Locomotive Building.

The Rogers Locomotive Works have completed two of the consolidation locomotives which they are building for the New York, Pennsylvania & Ohio.

The Western & Atlantic is building two passenger and freight locomotives at the Atlanta shops.

The Portland Locomotive Co. delivered this week the third of the locomotives they are building for the Boston & Maine.

Rix & Firth, of San Francisco, are building two locomotives, one for the Portland & Vancouver, of 15 tons, and the other for the Navarro Mill & Railroad Co., of 22 tons. This firm has built ten locomotives since last November.

Car Notes.

The Ohio Falls Car-Works at Jeffersonville, Ind., are building the 200 box cars recently ordered by the South Carolina road.

The Wells & French Co., of Chicago, Ill., is building a double-deck wrecking car for the Western of Alabama.

A new brick freight house 250 x 50 ft. is being erected in Washington by the Baltimore & Potomac, and will be completed in a few days. The company has also commenced work on a passenger and freight car shop between South Capitol and H streets. The shop will be of press brick, and will be 200 x 70 ft.

The Terre Haute Car Works are delivering 200 box cars to the Cincinnati, Sandusky & Cleveland road at the rate of six a day.

Fifty ore cars were received this week by the Alabama

Great Southern from the works of the United States Rolling Stock Co. in Anniston, Ala. The road has already received several hundred of these cars.

The Elliott Car Works, at Gadsden, Ala., are now turning out 6 cars per day. The Alabama Great Southern and the New Orleans & Northeastern have recently contracted with these works for a large number of ore and coal cars.

The Ohio Valley road has leased 250 new box cars from the American Contract Co. of New York.

The United States Rolling Stock Co. of Anniston, Ala., is receiving a large quantity of new machinery.

Bridge Notes.

The new four-span iron bridge over Mill Creek, on the Chattanooga Division of the Nashville, Chattanooga & St. Louis, has been completed, and the masonry for the bridge to be placed over Duck River, near Normandy, Tenn., has been completed and is ready for the superstructure, part of which has arrived.

The Roanoke Land & Improvement Co. has offered the Philadelphia Bridge Co., of Philadelphia, for the location of iron bridge works, a site at Roanoke, Va.

The Keystone Bridge Co., of Philadelphia, has been awarded the contract for building an iron bridge for the Elmira, Cortland & Northern, near Brockton, N. Y., to replace the present wooden one.

L. L. Buck, of Rochester, has been asked by the Mayor of Rochester, N. Y., to prepare plans, specifications, etc., for the proposed Dring Park Avenue Bridge.

Messrs. Crofode & Saylor have just completed a double track deck bridge over the Merrimack River at Newburyport, Mass., for the Boston & Maine road, from plans by Mr. Theodore Cooper, of New York.

Manufacturing and Business.

The Western New York & Pennsylvania has just placed in position, at its D., L. & W. crossing in Buffalo, a Gould-Tisdale revolving semaphore signal.

J. B. Schaffer & Co., of Rochester, N. Y., have recently received an order from the Canada Atlantic for a car wheel press.

The Rochester Car Wheel Works have in use 54 of the Barr contracting chills, and intend as soon as more can be received to use these chills exclusively.

The Buffalo, Rochester & Pittsburgh has placed an order with the Martin Anti-Fire Car Heater Co. for the equipment for 20 cars and 8 locomotives.

The Hoyt Frog and Crossing Co., of Chicago, has been incorporated in Illinois with a capital stock of \$1,000,000 by Frederick J. Hoyt, William E. Wolf and Frank L. Taylor.

The New York Iron Roofing and Corrugating Co., has recently built a large addition to their works in Jersey City. The company reports that it has been 300,000 sq. ft. behind on its orders for roofing and corrugated iron, although running night and day.

The new works of the Cleveland Twist Drill Co., of Cleveland, O., are nearing completion, and will probably be occupied by the firm early in November. The main building is 100 x 40 ft., with tempering and forge shops adjoining. New machinery will be added to keep up the increase in business.

The Baltimore & Ohio Co. is fitting up 20 cars with the Johnson electric heat regulating device, and will equip a large number of cars at once. A single car on this road has been equipped since last fall. Several other roads are also testing this device.

Charles A. Schieren & Co. report recent sales of their leather link belting to the following: Erie Car Works (Limited), Erie, Pa.; Gautier Steel Department, Johnstown, Pa.; Brinkley Car Works and Manufacturing Co., Brinkley, Ark.; Edison United Manufacturing Co., New York City.

Eynou & Ingersoll, manufacturers of machinists' tools, Cleveland, O., are building a new factory on Lake street, 100 x 40 ft., with L on Kirtland street, 100 x 40 ft. These buildings will be equipped with the latest machinery.

The Graydon Safety Car-Heater Co., of Indianapolis, will open branch offices in Chicago and in New York. The St. Louis, Vandalia & Terre Haute will equip several trains with the Graydon heater, in addition to the two trains upon which it is now used.

The Union Indurated Fibre Co., New York, has recently shipped some 50,000 ft. of pipe to the Bell Telephone Co., of Philadelphia, for use in underground work. This pipe is pressed out from wood fibre and treated so as to render it impervious. A number of fiberite battery jars were recently furnished the U. S. Signal Service, and Lieut. Frank Greene, of the Signal Corps, in charge of the telegraph division, considers that the jars will make an excellent substitute for the glass ones which have been in use, as they are not liable to breakage from freezing or violence in transit.

Iron and Steel.

The Fitchburg has contracted for 8,000 tons of heavy steel rails which it will use in the improvement of its track during the coming year.

The Chicago Steel Rail Co., of Chicago has been incorporated with a capital stock of \$200,000 by Samuel W. Adams, John Good and William A. Hinkins.

D. E. Garrison & Co., of St. Louis, have been awarded contract to furnish the rails, fastenings, frogs, switches, etc., for the Galveston jetty road. Between 300 and 400 tons of standard rails will be called for.

The North Chicago Rolling Mill Co. will build brick hot-blast stoves at its Bay View, Wis., blast furnaces, at a cost of nearly \$75,000. It is expected these stoves will increase the output of pig iron from 40 to 50 per cent., while causing a great saving in fuel.

The old rail mill at the Edgar Thomson Steel Works, which has not been in practical use since the new and more extensive one was erected, is being entirely remodeled and machinery put in place so as to transform it into a 4-in. billet mill.

The Rail Market.

Steel Rails.—Sales during the week have amounted to 12,000 tons in two lots, one lot for a New England road and the other for a Western New York road. A sale of 3,000 tons to a Southern road is also reported. The allotment for 1888 has been increased 200,000 tons. Quotations, \$28@ \$28.50 for winter delivery.

Old Rails.—The market is weaker, with little business. Considerable old rails have come into the market in exchange for new rails. Quotations for tees, \$23 50.

Track Fastenings.—Spikes are quoted at 2.25c., and angle bars at 2.05@2.10c.

Continuous Heating in New England.

A Boston paper reports the following interviews on the subject of continuous heating:

Mr. J. T. Furber (General Manager Boston & Maine) stated that "Massachusetts legislators have taken little or no formal action in relation to the method of heating cars, but public sentiment seems to have demanded more than law could have commanded. The public seems to be desirous of having the railroad cars heated by steam, and I have already given orders for the equipment of several of our trains for the purpose of experiment. I do not believe it is the best way of heating them. I do not believe there has yet been discovered an apparatus so good as the Johnson and Baker heaters. I have never heard of a car being set on fire by the use of either of these systems, and I have known several

trains equipped with both heaters to be thrown down steep embankments.

"We shall try the use of steam from locomotives, and shall use the Sewell heater. If it proves to be the method for warming coaches, we shall, of course, adopt it. I fully believe making this trial is a waste of money simply to gratify the whim of a lot of cranks. The chief trouble is to keep side-tracked cars warm. That difficulty could be obviated only by having a steam-heating plant in continuous operation at all the places along the line where we are accustomed to side-track cars, Reading, South Lawrence and Exeter, for instance. This could be done, of course, but only at an enormous expense. A thorough experiment will be made this winter, however, and then I rather think we shall go back to the old system."

John Adams (General Superintendent Fitchburg): "Our first cars were equipped with steam one year ago last February, and, so far as we know, they worked satisfactorily. We use the Sewell system, and have it in about 80 of our cars now. In all we have 179 passenger coaches and 46 baggage cars, and we hope to have about half of them fitted for steam heating this winter. The greatest difficulty is to keep side-tracked cars warm."

Mr. I. N. Marshall (Superintendent Northern Division, Old Colony): "We are well satisfied with the Johnson heater, but have experimented with three or four systems of continuous heating already, and probably shall go further this winter."

Mr. A. A. Jackson (Superintendent New York & New England): "By Jan. 1 we shall have between 80 and 90 cars heated by steam. We believe the New York Safety Car Heating and Lighting Company's device for warming cars is the most practical under all circumstances. In case of a snow blockade, when the engine could not do its work, the Sewell would be very ineffective except where the supplementary heater has been placed beneath each car, and in any such case the snow would have to be dug away from beneath the cars. In the New York company's system the Baker heaters are used, all being connected with the engine, and when side-tracked or blocked by snow a fire can easily be built in the heater as of old, and the car be warmed. Then when the engine is attached again the fire in the heater is allowed to go out and the steam-heating apparatus is in full blast."

"We have found the greatest trouble in getting a proper coupler. There is where the systems vary most, too. The matter of piping the cars is not so difficult, but when it comes to applying a coupler that shall be universal and effective there is liable to be trouble."

"We have not used any particular coupler. We have applied the steam to the cars through the Westinghouse brake pipes, and have found it to work very well."

"It is an expensive undertaking to equip 175 cars and engines besides, with any system. And before we go to the expense of equipping all our plant we want to be sure we have the right thing."

A 335-foot Chimney.

The Clark Thread Company have just added to their new factory, in the suburbs of Newark, N. J., the tallest chimney in this country, and what is in the strict use of the word chimney the tallest in the world, as the Townsend, 454 ft., and the St. Rolox, 436½ ft., both of Glasgow, and Dobson & Burlew's, 367 ft., at Bolton, were built to carry off the fumes from chemical works, and are not used, it is believed, as smoke-flues. The Clark chimney, however, is built to create draft for 22 boilers of an aggregate capacity of 4,000 horse-power.

The foundation, a mass of Portland cement concrete, 40 ft. square and 5 ft. thick, with 9 ft. of brickwork on top of it, was laid during the winter under a temporary house. The shaft consists of two rings for 165 ft.; the inner one 11 ft. interior diameter and 20 in. thick, and the outer one 28 ft. 6 in. in outer diameter and 5 ft. 4 in. thick at the base. The interior diameter draws in to 10 ft. 4 in. at the top, which flares out to a bell about 20 ft. in diameter, and is capped with a cast-iron cap, in 16 sections, weighing about 100,000 lbs. Two arched flues lead into the brickwork base of the chimney. The height above the surface is 335 ft.

The chimney, which contains 1,700,000 bricks, was built in 105 days by eight bricklayers and four helpers from internal scaffolding, and the materials were carried up to them by an ordinary platform elevator run by a hoisting engine. The total weight on the foundation is computed to be 10,000,000 pounds, or about 2½ tons per square foot. The cost was about \$35,000, and the stack is a beautiful landmark for miles around.

Sandpapering Machines.

These ingenious and simple machines for polishing wood are already in use in many well-equipped car shops. Most of them have been designed and built by the Egan Co., of Cincinnati, who make them in great variety, for polishing almost any shape and kind of material.

Soft Steel for Structural Uses.

A circular has been sent out by Carnegie, Phipps & Co. stating that the firm will make the same prices for soft steel plates as are now quoted for iron plates for bridges, ship, tank and structural work generally. In an interview in a local paper a member of the firm said:

"The circular is a surprise to many from the fact that steel plates are openly offered at practically the same price as iron, though we have been selling them for some time. While steel for such purposes is being sold about as low as iron, prices have stiffened a little recently. It can scarcely be called an advance, but a hardening up of the market, as the demand is now good."

A Steamer for the Central of New Jersey.

The Central of New Jersey has closed a contract with Harlan & Hollingsworth to build another steamboat to run between New York and Long Branch next season. It will be about the same length as the Monmouth.

The New St. Louis Bridge.

The directors of the Merchants Bridge & Terminal Co. of St. Louis are said to have adopted plans for the new bridge across the Mississippi, and the plans will be at once forwarded to the Secretary of War for approval. The location decided on is about two miles north of the present bridge, crossing the river from the foot of Ferry street to the north line of the corporation boundary of Venice, on the Illinois shore. It is said that the plans provide for 3 spans of 522 ft. each, and approaches of 425 ft. on either side.

The Electric Motor in Railroad Shops.

The Pennsylvania Railroad Co. has contracted for a Sprague electric motor to operate a transfer table at the Altoona shops. One has been in use at the Aurora shops of the Chicago, Burlington & Quincy for about a year.

Steel Railroad Cars.

It is reported that a company has been organized in Washington to manufacture cars constructed entirely of sheet steel, under the patents of C. W. M. Smith, of San Francisco. The cars will be built near Chicago. It is claimed for the new vehicles that they are absolutely indestructible and non-combustible, and can be built as cheaply as wooden coaches.

General Railroad News.

MEETINGS AND ANNOUNCEMENTS.

Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

Denver & Rio Grande, quarterly 1¼ per cent., on the preferred stock, payable Nov. 12.

Long Island, quarterly, 1 per cent., payable Nov. 2.

New York, New Haven & Hartford, quarterly, 2½ per cent.

St. Louis & San Francisco, 2½ per cent., on preferred stock, payable Oct. 31.

Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

Alabama Midland, special meeting, Montgomery, Ala., Oct. 13, also Bainbridge, Oct. 16.

Central Branch Union Pacific, annual meeting, Atchison, Kan., Oct. 16.

Columbus, Springfield & Cincinnati, annual meeting, Sandusky, O., Oct. 18.

Danvers, annual meeting, Boston & Lowell passenger station, Boston, Oct. 17.

Donnington & Lancaster, 233 South Fourth street, Philadelphia, Pa., special meeting Nov. 5.

East Tennessee, Virginia & Georgia, special meeting, Knoxville, Tenn., Oct. 18.

Hudson Connecting, special meeting, Room 11, Mills Building, 35 Wall street, New York, Oct. 30.

Indianapolis, Decatur & Western, annual meeting, South Meridian street, Indianapolis, Ind., Nov. 6.

Newburyport, annual meeting, Boston & Lowell passenger station, Boston, Oct. 17.

New York & Northern, annual meeting, 96 Broadway, New York, Oct. 15.

Ohio & Mississippi, annual meeting, Union Depot, Cincinnati, O., Oct. 11.

Poughkeepsie Bridge, special meeting, Room 11, Mills Building, 35 Wall street, New York, Oct. 30, to vote on a proposition to mortgage the road for \$200,000.

Poughkeepsie & Connecticut, special meeting, Room 11, Mills Building, New York, Oct. 30, to vote on a proposition to create a mortgage for \$1,000,000.

Raleigh & Gaston, annual meeting, New York, Nov. 8.

Western Maryland, annual meeting, Baltimore, Md., Oct. 17.

Railroad and Technical Conventions.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The American Society of Mechanical Engineers will hold its eighteenth convention and ninth annual meeting in Scranton, Pa., beginning Monday evening, Oct. 15.

The American Association of Railway Chemists will hold its next meeting in Baltimore, Md., in October.

The New England Railroad Club meets at its rooms in the Boston & Albany passenger station, Boston, on the second Wednesday of each month.

The New York Railroad Club meets at its rooms, 113 Liberty street, New York City, at 7:30 p. m., on the second Thursday in each month. The next meeting will be held Oct. 11.

The Central Railway Club meets at the Tift House, Buffalo, the fourth Wednesday of January, March, May August and October.

The American Society of Civil Engineers holds its regular meetings on the first and third Wednesday in each month, at the House of the Society, 127 East Twenty-third street, New York.

The Boston Society of Civil Engineers holds its regular meetings at its rooms in the Boston & Albany station, Boston, at 7:30 p. m. on the third Wednesday in each month.

The Western Society of Engineers holds its regular meetings at its hall, No. 67 Washington street, Chicago, at 7:30 p. m., on the first Tuesday in each month.

The Engineers' Club of Philadelphia will hold its next meeting at the house of the Club, 1,122 Gerard street, Philadelphia, Oct. 6.

The Engineers' Society of Western Pennsylvania holds regular meetings on the third Tuesday in each month, at Pittsburgh, Pa.

The Engineers' Club of Kansas City meets at Kansas City, Mo., on the first Monday in each month.

The Civil Engineers' Society of St. Paul meets at St. Paul, Minn., on the first Monday in each month.

The Montana Society of Civil Engineers meets at Helena, Mont., on the third Saturday in each month.

American Railway Master Mechanics' Association.

Mr. J. H. Setchel, President of the Association, has removed to Cuba, N. Y., and that will in future be his address.

Mr. Angus Sinclair, Secretary, has removed from Chicago, and his office address in future will be Morse Building, 140 Nassau street, New York.

Engineers' Club of Kansas City.

A regular meeting was held Oct. 1. The following were elected members: J. N. Walker, S. H. Yonge and H. H. Filley; S. P. Maybach was elected an associate member. It was stated that papers had been promised for nearly every meeting up to March. Mr. A. J. Mason read a paper entitled "The Complete Sewerage of Kansas City," which was discussed by several members. A letter from C. R. Taylor, of Philadelphia, was read, describing a new patent for street pavements.

The Mining Engineers.

The American Institute of Mining Engineers held its fifty-second meeting in Buffalo, Oct. 2 to Oct. 6. The first session was held Tuesday evening, Oct. 2, and the members were received with an address of welcome by Dr. Julius Pohlmann, to which the President replied, following his introductory remarks with a paper on the Needs of Mining Engineers. He held that, valuable as are the existing schools, they still do not give sufficient practical or exact information, and that opportunity for practice should be afforded to students by large public engineering laboratories, with full-sized machinery, to be operated on a public basis and used for tests of material and of processes.

At the same session Dr. R. W. Raymond read a paper on a gold breastplate from Central America. This breastplate was recently dug up by miners who were seeking a foundation for a stamp-mill at the Great Remance quartz mines, 15 miles from the city of Santiago. He judged it to be at least 400 years old, for after the invasion of Cortez the natives were not allowed to be buried with any examples of their famous art of gold-making. These breastplates are now exceedingly rare, from the fact that the Spanish invaders were great friends of the melting-pot. This plate is of 23 karat gold and weighs 110 pennyweights. It is of curious

design and skillful workmanship. It represents a bat with outstretched wings. The body is the head and neck of a deer, while the antlers are in the form of alligators. It was undoubtedly a totem, or coat of arms, representing the elements, air, water and land. The wings of the bat are of beaten gold welded to the head in a masterly way. The body was cast hollow, and the wonderful thing is that the casting shows a higher degree of workmanship than the hammered work.

Wednesday was devoted to an excursion to the Brooks Locomotive Works, at Dunkirk, N. Y. The members of the Institute were received by the officers of the company, who showed them the various departments of the establishment, which now employs over a thousand men and turns out four locomotives a week. After this interesting visit the members were entertained at the house of the Brooks family, where luncheon was served, and in the afternoon the visitors returned to Buffalo.

At the evening session a paper by Capt. F. B. Green was read on The Uses of Asphalt, also one on The Life History of Niagara Falls, by Dr. Julius Pohlmann, and one on Soaping Geyers by Dr. R. W. Raymond.

Thursday was devoted to local excursions. The largest party was in charge of Deputy City Engineer E. B. Guthrie, and left the foot of Main street at 9 a. m., on tugs bound for the Union Bridge Co.'s works. The Tift Farm improvement, and some of the grain elevators were also inspected. The Government breakwater was visited, and the tourists next visited the city water-works. From this place they went to the works of the Buffalo Cement Co. The gas wells, quarries, and kilns were examined, and lunch was served. The visitors next took carriages, provided by the Barber Asphalt Co., and were given a chance to see the parks and some of the asphalt-paved streets, as well as streets in process of being paved. Some of the guests visited the asphalt works, the Wagner car works, and local machine shops.

A dinner was held in the evening at the Niagara Hotel. The third session was held Friday morning. The papers read were: Steel Rails, by Robert W. Hunt, of Chicago, and The Electrical Transmission of Power, by R. P. Rothwell, of New York.

The fourth session was held Friday evening and a paper was read on Forestry and Mining, by B. E. Fernow, of Washington. At this session the following papers among others were presented by title:

Anthracite and Coke, Separate and Mixed, in the Warwick Blast Furnace, by Edgar S. Cook. Note on a Tuyere Slagging Valve, by Edgar S. Cook. Note on a Speed and Pressure Regulator for Blast-Furnace Engines, by Edgar S. Cook. A Differential Hot-Blast Stove and its Application to an Open Hearth Blast Furnace, by Jacob T. Wainwright. Notes on the Roasting of the Hudson River Carbonate Ores, by Ingersoll Olmsted. Note on a Cast Steel Water Jacket, by R. H. Terhune. The Flue Dust of the Furnaces at Low Moor, by Ellison C. Means. Water Analysis, by A. E. Hunt and George H. Clapp. The Handling of Natural Gas, by John F. Wilcox. Pig Iron of Unusual Strength, by Fred. P. Dewey. Improved Methods of Refining the Oils of the Findlay Field of Ohio, by Prof. William H. Pitt. The Relation Between the Ore Mixture and the Reduction of Silica in the Blast Furnace, by B. F. Fackenthal, Jr. The Carbon Theory of Hardening Steel, by Henry M. Howe. The Equalization of Load on Winding Engines by the Employment of Spiral Drums, by E. M. Rogers. Ferro-Silicon and the Economy of its Use, by W. J. Keep and Edw. Orten, Jr.

On Friday visits were made to the Holly works and the Cowles works at Lockport.

On Saturday an excursion was made to the rock salt mine of the Retsof Company, at Piffards, N. Y.

The next meeting will be held in New York in February. Over 50 new members were elected.

PERSONAL.

—Maj. C. C. Wrenshall, Superintendent of the Anniston & Cincinnati, has resigned, and Charles K. Scott has been appointed to succeed him.

—Mr. George B. Cornell has resigned as Chief Engineer of the Brooklyn Elevated Co. to take the same position on the Chicago & South Side Rapid Transit Co.

—Charles Hoffman, who has been Auditor of the Fort Wayne, Cincinnati & Louisville since 1874, has resigned, to go into business in Denver, and has been succeeded by John Evans.

—Sir Henry Tyler, President of the Grand Trunk, who has been making a tour of the United States and Canada, returned to Europe on the Servia, leaving New York on the 6th inst.

—Aaron King, for over 30 years conductor on the Worcester & Nashua and later Division Superintendent on that road (now the Boston & Maine), died at Nashua, N. H., Oct. 4, aged 70 years.

—Emanuel Bawden, Superintendent of the Evansville & Terre Haute, the Peoria, Decatur & Evansville, and the Evansville & Indianapolis roads, died in Evansville, Ind., Oct. 4, from the effects of cancer of the stomach.

—D. L. Wing, President and General Manager of the St. Louis & Chicago, has resigned, and L. S. Graves, the Superintendent, has been elected to succeed him. Mr. Wing is the President of the Mount Olive Coal Co., and will devote his attention to the interests of that corporation.

—Mr. T. F. Oakes, who has just been elected President of the Northern Pacific, to fill the place vacated by Robert Harris, who assumes the Chairmanship of the Board of Directors, was tendered a banquet by the business men of St. Paul at the Hotel Ryan, in that city, on the evening of Oct. 4. Among the guests were Henry Villard, Charles Francis Adams, Edward Canfield and Prof. von Eschsch, of Berlin.

—At a meeting of the directors of the Pennsylvania this week, the resignation of John S. Wilson as General Freight Traffic Agent was accepted, and in doing so they passed a resolution in which they express their sincere regret at the termination of his connection with the service of the company and their high appreciation of the ability and fidelity with which he has performed the important duties entrusted to him. William H. Joyce was appointed to succeed him, with the title of General Freight Agent. Mr. Joyce is a young man, and has been in the service of the company since 1869, filling various important positions. He was General Freight Agent of the Northern Central prior to his selection to fill the position of Coal Freight Agent of the Pennsylvania.

—H. S. Cross and George Eddy have been appointed Receivers of the Missouri, Kansas & Texas. J. J. Frey, the present Superintendent, has been appointed General Manager under the Receivers. Mr. Cross is at present a Bank President in Emporia, Kan. For a number of years he has been a director of the Missouri, Kansas & Texas. At one time he was President of what is now known as the Ottawa Branch of the Atchison, Topeka & Santa Fe, and has been President of the Emporia & St. Louis, as well as of the Kansas, Kanopolis & Central. He has also been a director and Vice-President of the Inter-state Railroad and a director of

what is now known as the Howard Branch of the Santa Fe. Mr. Frey has been with the Missouri Pacific system since 1868, and since Division Superintendent or Superintendent of some of the branches of that system. In August last he was appointed Division Superintendent of the Missouri, Kansas & Texas.

—Henry Monett, General Passenger Agent of the New York Central & Hudson River, died Oct. 9, at 5 p. m., at his home in Yonkers, N. Y. His death was due to pneumonia, resulting from a severe cold contracted last week while on an inspection tour with the officers and directors. Mr. Monett was born Dec. 3, 1853, in Columbus, O., where he will be buried. In June, 1869, Mr. Monett became Messenger and Ticket Agent in the office of the General Passenger Agent of the Pittsburgh, Cincinnati & St. Louis, and held the position up to 1873. His connection with the Pennsylvania's lines lasted until July 1, 1882, the positions held by him being those of Rate and Division Clerk of the Pittsburgh, Cincinnati & St. Louis, and of the Pennsylvania Co. at Pittsburgh from 1873 to 1874; Chief Clerk in the General Passenger Department of the same railroad from 1874 to 1880, and Assistant General Passenger Agent from Jan. 1, 1880, to April 1, 1881, and for the next year Chief Assistant General Passenger Agent of the Pennsylvania Co. and the Pittsburgh, Cincinnati & St. Louis. A year later he was made General Passenger Agent of the New York, Chicago & St. Louis. In March, 1883, he became General Passenger Agent of the New York, West Shore & Buffalo. He opened both these new roads for passenger service. When the position of General Passenger Agent of the New York Central & Hudson River was left vacant by the death of Daniel M. Kendrick Mr. Monett was selected to fill it and took charge Feb. 1, 1887.

The general sentiment of those who knew Mr. Monett is well expressed in the following comment of Commissioner S. F. Pierson.

"Mr. Monett was a man of exceptional ability, and in every position he ever occupied he left a place which it would be difficult to fill with his equal. He was a man of broad views, but grasped a subject with wonderful quickness, formed his opinions with rapidity and judgment, and having formed them, was prompt to act upon them. He had laid the foundation for a career as a railroad man which would, had he lived, have been one of the brightest in the annals of railroad history, and I know of no railroad man who can be so ill spared or whose loss will be more widely and deeply mourned."

Mr. Monett leaves a wife and three young children.

ELECTIONS AND APPOINTMENTS.

Astoria & South Coast.—The names of the officers of this Oregon company are as follows: President, John A. Devlin; Vice-President, F. J. Taylor; Secretary, E. A. Taylor; Directors, J. A. Devlin, I. W. Case, D. K. Warren, M. C. Crosby, David Morgan, M. J. Kinney, F. J. Taylor, J. W. Conn, and C. W. Fulton.

Baltimore & Ohio.—John W. Davis, First Assistant to the President, has been placed in charge of the tax department of the road, the position of first assistant having been abolished.

Bradford, Eldred & Cuba.—Frank W. Baker has been appointed Agent for Receiver and Auditor, with office at Addison, N. Y.

Brooklyn & Brighton Beach.—At the annual meeting of the stockholders of this company, Oct. 3, the following directors were elected: Aaron S. Robbins, William Marshall, George I. Murphy, James Jourdan, of Brooklyn; Abraham B. Bayles, Uriah A. Murdock and William Moor, of New York city. The Board of Directors elected Gen. James Jourdan, President; Col. E. L. Langford, Secretary and Treasurer, and J. L. Morrow, General Superintendent.

Chattanooga, Rome & Columbus and Rome Railroad of Georgia.—G. W. Ettenger has been appointed Purchasing Agent of the above named companies, with office at 115 Broadway, New York.

Chicago, Detroit & Canada Grand Trunk Junction.—At the annual meeting in Detroit the following directors and officers were chosen: Joseph Hickson, L. J. Seargeant, E. W. Meddaugh, John Bell and Robert Wright; Joseph Hickson, President; L. J. Seargeant, Vice-President, and Robert Wright, Secretary and Treasurer.

Chicago & Ohio River.—Austin Corbin has been elected President.

Chicago, Santa Fe & California.—W. P. Moore has been appointed Assistant Superintendent in charge of terminals at Chicago. He will report to the General Superintendent. Commencing Oct. 10, all work pertaining to maintenance of this road is transferred from the Construction to the Operating Department, and is placed in charge of Mr. D. J. Chase, General Superintendent, whose jurisdiction is extended in accordance therewith.

Concord & Portsmouth.—The following directors were elected at a meeting in Manchester, Oct. 4: Samuel N. Bell, Walter M. Parker, Moody Currier, Manchester; Joseph B. Walker, Concord; John J. Bell, Exeter; William A. Pierce, Portsmouth.

Detroit & South Lyons.—The following officers were elected at the annual meeting in Detroit last week: Directors, Joseph Hickson, E. W. Meddaugh, A. B. Maynard, William J. Spicer, and James H. Muir, of Detroit. Officers: Joseph Hickson, President; A. B. Maynard, Vice-President, and James H. Muir, Secretary and Treasurer.

Dover & Winnipiseogee.—The stockholders have elected the following directors: William Hale, of Dover; John McDuffee, of Rochester; George C. Lord, of Boston; William S. Stevens, of Dover; Amos Paul, of South Newmarket; Frank Jones, of Portsmouth, and Elisha R. Brown, of Dover.

Dubuque & Sioux City.—A meeting of the stockholders was held in Dubuque, Oct. 3. Six new directors were added to the list, making fifteen, as follows: W. J. Knight, J. V. Rider, M. M. Walker, John T. Hancock, all of Dubuque; S. L. Dows, Cedar Rapids; A. S. Garretson and J. F. Penney, of Sioux City; E. H. Harriman, Chicago; Stuyvesant Fish, S. V. R. Cruger, John Anthon, H. F. Webster, E. C. Woodruff, A. Wilcox and W. D. Guthrie, New York.

Fort Wayne, Cincinnati & Louisville.—E. A. Wales, formerly Paymaster and Chief Clerk, has been appointed General Ticket Agent. S. A. Wikel, General Freight and Ticket Agent, retaining charge of the freight department. John M. Evans has been appointed Auditor, with office in Fort Wayne, Ind., to succeed Charles Hoffman, resigned.

Lake Erie & Western.—The stockholders held their annual meeting at Bloomington Ill., last week and elected the following three directors: George F. Baker, Nelson Robinson and Edward Tuck, all of New York.

Louisville & Nashville.—The annual meeting was held at Louisville, Oct. 3. The total stock represented was 203,434

shares. The election of directors resulted in the choice of the following: August Belmont, Jr., F. W. Foote, J. A. Horsey, John H. Inman, Arnold Marcus, William Mortens, Ex. Norton, J. S. Rogers, J. P. Probst and Thomas Rutter, of New York City; M. H. Smith, John D. Taggart, John A. Carter, of Louisville. At the meeting of directors the old officers were elected: Ex. Norton, President; M. H. Smith, First Vice-President; A. M. Quarrier, Second Vice-President; E. B. Stahlman, Third Vice-President.

Marysville, Sutter City & Colusa.—At the meeting of the Board of Directors, held in San Francisco recently, the following officers were elected: President, A. Badlam; Vice-President, W. H. L. Barnes; Secretary, J. L. Boone.

Mason County Central.—The names and addresses of the officers of the company are: President, W. H. Kneeland, Shelton, W. T.; Treasurer, Marten Lewis, Shelton, and Vice-President, Col. N. Owens, Olympia, W. T.

Memphis, Little Rock & Indian Territory.—F. F. Smith is Secretary of this company, and Thomas Schwanecke is Chief Engineer.

Michigan Air Line.—The following directors were elected at the annual meeting in Detroit: A. B. Maynard, Joseph Hickson, James McMillan, M. A. McNaughton and E. W. Meddaugh; President, Joseph Hickson; Vice-President, A. B. Maynard; Secretary and Treasurer, Robert Wright.

Missouri, Kansas & Texas.—Judge Brewer, of the United States Circuit Court, at Leavenworth, Kan., has appointed George A. Eddy, of Leavenworth, and Harrison C. Cross, of Emporia, Kan., joint Receivers. J. J. Fry, the present Superintendent, has been appointed General Manager under the Receivers. The appointments will take effect Nov. 1.

Monterey & Gulf.—General Trevine, of Monterey, Mex., is President of this company, and T. S. Dullock, of New York, is Vice-President. A. Robertson and Colonel J. J. Fisher, of St. Louis, are directors.

Newport & Wickford.—At the annual meeting in Newport, Oct. 2, the following officers were elected: President, George M. Miller, of New York; Secretary and Treasurer, Anthony S. Sherman; directors, George M. Miller, John N. A. Griswold and David King, of New York; John G. Weaver and George Peabody Wetmore, of Newport, and S. H. Vaughan, of Wickford, R. I.

Northern Pacific & Manitoba.—The following officers have been elected: James McNaught, President; J. H. Kendrick, First Vice-President; Joseph Martin, Railway Commissioner, Second Vice-President; L. M. Randall, Secretary; E. B. Morrison, Comptroller and Treasurer; J. M. Graham, General Manager.

Ore Belt.—The names and addresses of the officers of this new Georgia company are as follows: A. Richardson, President; J. J. Lampton, Vice-President; M. A. Wright, Secretary and Treasurer; Percy Lumley, Chief Engineer. The general office is at Cedartown, Ga.

Pullman Palace Car Co.—John S. Runnells has been appointed General Counsel of the company, vice Mr. Alfred Ennis, resigned.

Quincy, Omaha & Kansas City.—J. H. Best, Jr., has been appointed Traffic Manager, with headquarters at Quincy, Ill.

Richmond & Allegheny.—W. A. Crawley, having resigned as Purchasing Agent to accept other employment, the position has been abolished. Requisitions and communications relating to supplies are to be addressed to the Receiver and Manager, Richmond, Va.

St. Louis, Baxter Springs & Oklahoma.—Col. Edward Burgess, of St. Louis, is President of this company; W. H. Horner, of Baxter Springs, Kan., is Treasurer, and C. H. Weagley, of Baxter Springs, is Secretary.

St. Louis & Chicago.—L. S. Graves has been chosen President and General Manager, with office in Springfield, Ill., to succeed D. L. Wing, resigned.

St. Paul, Minneapolis & Manitoba.—Charles W. Case has been appointed General Superintendent, with headquarters at St. Paul. He will assume general charge of the maintenance of roadways and structures and of station and transportation service.

Sheffield & Birmingham.—B. M. Levis has been appointed Master Mechanic with headquarters at Sheffield, Ala.

Western Union Telegraph Co.—The annual meeting of the stockholders was held in New York, Oct. 10. The following officers were elected: Norvin Green, President; Thomas T. Eckert, Vice-President and General Manager; John Van Horne, George J. Gould and Robert C. Clowry, Vice-Presidents; J. R. Van Every, Acting Vice-President and Auditor; A. R. Brewer, Secretary; R. H. Rochester, Treasurer; George H. Fearsons, Attorney. The board of directors elected is as follows: Norvin Green, Thomas T. Eckert, John T. Terry, John Van Horne, Jay Gould, Russell Sage, Alonzo B. Cornell, Sidney Dillon, George J. Gould, Samuel Sloan, Cyrus W. Field, Robert C. Clowry, Henry Weaver, Percy R. Pyne, Austin Corbin, J. Pierpont Morgan, Frederick L. Ames, John Hay, William D. Bishop, John G. Moore, C. P. Huntington, George B. Roberts, Charles Lanier, Edwin Gould, Erastus Wiman, John J. Astor, Chauncey M. Depew, James W. Clendenin, Sidney Shepard and Henry M. Flagler, the latter to succeed A. B. Vest, deceased.

OLD AND NEW ROADS.

Alabama Midland.—The final location from Bainbridge, Ga., to the connection with the Northwest & Florida in Alabama, about 170 miles, has been nearly completed, and it is expected that construction work will commence at Bainbridge this month.

Astoria & South Coast.—The engineers are now in the field, running the lines for the preliminary survey. The route is southerly from Astoria, Or., to the Seaside House, thence up the Necanicum River to the divide between it and the Nehalem River, thence to the Nehalem and thence to a point on Tillamook Bay. It is the intention to continue on to the Willamette Valley to connect with standard gauge roads there. That part of the road from Astoria to the Seaside House, 18 miles, is to be completed by next May.

Bowling Green, Hartford & Ohio River.—At a recent meeting of the Board of Directors at Calhoun, Ky., it was decided to extend the road from Bowling Green to Chattanooga, giving them a trunk line from Chicago to that city. Arrangements were entered into for securing a corps of engineers, and the survey will be made at once.

Bradford, Eldred & Cuba.—By a recent order of Judge Lewis, T. C. Platt, Receiver, was authorized to take up the rails on the Cuba Branch, from Cuba, N. Y., to

Little Genessee, 18 miles, and dispose of them together with some of the rolling stock of the company.

Carolina, Cumberland Gap & Chicago.—It is stated that the engineers have succeeded in finding a route through the Blue Ridge Mountains, with a grade not exceeding 80 ft. per mile.

Central of New Jersey.—Surveyors are reported engaged running a line from the New Jersey Southern road southward from near Winslow to Cape May for a road to be built in the interests of this road and the Philadelphia & Reading.

Chicago & New Orleans.—The survey from Shumway, Effingham County, to Metropolis City, Ill., on the Ohio River, a distance of 152 miles, has now been completed, and the right of way secured. The first 100 miles of the line lies through a comparatively level country, and the next 30 miles through hills. That part near the Ohio is rather swampy.

Chicago, St. Louis & Paducah.—The track has now been laid from Parker City to Metropolis, Ill., 31½ miles. But 7 more miles remain to complete the road to its southern terminus at Brooklyn, Ill., opposite Paducah, Ky. The company hope to have the road and the transfer in operation next winter. The road is leased to the St. Louis & Cairo Short Line, and connects with that road at Marion, Ill., and passes through New Burnside and Parker City to the Ohio River at Paducah. The contractor for grading, bridging and tracklaying is N. W. Irish, of Carlyle, Ill. E. W. Meuscher is Chief Engineer.

Columbia Central.—The company has been organized to build a branch of the Baltimore & Drum Point, from a point on the line of that road near Millersville, in Anne Arundel County, to the line of the District of Columbia near Washington, a distance of 13 miles. A company is to be organized to continue the line to the city of Washington.

Concord & Portsmouth.—At a meeting in Manchester, N. H., Oct. 5, the stockholders adopted a resolution authorizing an increase of the capital stock from \$350,000 to \$500,000, and providing that it be allowed at par to holders of stock in proportion to the amount held at the time of issue.

Dubuque & Sioux City.—At a meeting of the stockholders in Dubuque, Ia., last week, the capital stock was increased from \$5,000,000 to \$8,000,000. The new stock is to be issued in exchange for stock of the Iowa Falls & Sioux City, Cedar Rapids & Chicago and the Cherokee & Dakota roads. Meetings were also held by the stockholders of the Iowa Falls & Sioux City, Cedar Rapids & Chicago and the Cherokee & Dakota companies, in which similar action was taken.

Duluth & Winnipeg.—The contract for building the first 10 miles of the road from Duluth is said to have been let.

East Tennessee, Virginia & Georgia.—At a meeting of the directors last week, President Scott of the Richmond & Danville, submitted a proposition for a lease of the road for 99 years on a percentage of earnings. The directors passed a resolution unanimously agreeing to this proposition, and appointed a committee to consult with the officers of the Richmond & Danville and Richmond Terminal Co., for the purpose of drawing up a lease to be presented for ratification.

The directors have adopted a resolution instructing the engineers to survey a route from some point on the Brunswick division to Savannah, and also to report on the cost of four steamships suitable for service on a route between Savannah or Brunswick, Ga., and New York.

Georgia Southern & Florida.—The road has now been completed to Macon 65 miles from Cordele, Ga., on the Americus, Preston & Lumpkin.

Gloucester & Atco.—A corps of engineers is at work upon the preliminary survey of this proposed road. It has reached a point five miles below Gloucester, N. J., and will get through to Atco in about two weeks. The line is 16 miles long.

Hereford.—The trouble with the Italian laborers on this road, who were defrauded of their wages by the contractors defaulting, has at last been amicably arranged, and they have returned to work. They had several encounters with the militia, in which two or three were killed and others wounded.

Kentucky Union.—The right of way between Hedges Station and Winchester, Ky., a distance of 83 miles, has been secured, and the work of construction will begin in the spring.

Lime Rock.—This Maine road has now been nearly completed and will soon be opened for traffic. It extends from Lime Rock quarries to the water front in Rockland, and forms a belt line around the city, connecting the Knox & Lincoln road with the quarries, and is about 5 miles long.

Louisville, St. Louis & Texas.—That portion of the line between Owensboro, Ky., and Henderson, Ky., will be ready for tracklaying by Oct. 15.

Louisville Southern.—The Jessamine County (Kentucky) Court has ordered that the county subscribe \$150,000 to the stock of this road, to secure the building of an extension to its county seat, Nicholasville, via Lexington and Beattyville, Ky.

Lynchburg & Durham.—Regular trains are now running from Lynchburg, south of Rustburg, Va. This part of the road was graded last year, but it has been necessary to almost entirely rebuild it. The work of completing the road south to Durham, N. C., is being pushed very rapidly.

Mann's Boudoir Car Co.—A controlling interest in the stock of Mann's Boudoir Car Co. has been sold to a syndicate of capitalists. It is denied that the control has passed into the hands of the Wagner Company, although a rumor to that effect is current.

Marietta & North Georgia.—It is announced that arrangements have been made for at once beginning work on the proposed extension to Atlanta, Ga. The widening of the gauge to standard between Marietta and Jasper, 50 miles, will also soon be commenced.

Mason County Central.—The first three miles of the road from Shelton, Wash. Ter., is now being built by the company's men. When this is completed contracts will be let in five-mile sections for building the remainder of the road to the Chehalas River.

Memphis, Little Rock & Indian Territory.—Work has been commenced on this road near Hot Springs, Ark., all the right of way has been secured, and the work is to be completed between Little Rock and Hot Springs within twelve months.

Mexican National.—The first through train from the City of Mexico to Laredo, Tex., over the Mexican National,

arrived in Laredo, Oct. 3, having on board prominent officials of the road. This road will be opened on Oct. 15, for through freight traffic, and on Nov. 1 for through passenger traffic.

Mexican Railroads.—The proposed road between Matamoros and Bagdad is to be called the Oriental Fronterizo Railroad, and the company has already been organized, with Don Marcelino Roguir as President and Señor Antonio Desague as Secretary. A concession will be asked of the Federal Government. Mines of quicksilver and silver have been discovered near Victoria, Tamaulipas.

Milwaukee, Lake Shore & Western.—The Rhinelander branch extension has been opened for business from Rhinelander, Wis., to the line of the Lac du Flambeau Indian reservation, 27 miles northwest of Rhinelander.

Missouri, Kansas & Texas.—Judge Brewer, of the U. S. Circuit Court, at Leavenworth, Kan., has appointed H. C. Cross and George A. Eddy Receivers of this road. Each is to furnish \$200,000 bonds. The Receivers were appointed on the application of the Mercantile Trust Co., and the Union Trust Co., of New York, trustees of the first mortgage bonds, and was opposed by the Missouri, Kansas & Texas stockholders.

Monterey & Gulf.—Active work on this road was commenced at Monterey, Mex., last week. The road is to extend from Monterey southward to Tampico, on the Gulf of Mexico, a distance of 325 miles. As already noted, the contract for building the first 40 miles has been let to Sullivan Brothers. The contract for the whole line has been let to Morris R. Locke & Co., of Jerseyville, Ill.

Northern Pacific.—The company is now constructing a branch from Cheney, Wash. Ter., to Davenport, a distance of 30 miles. This line is to be continued to Grand Coulee, Wash. Ter., on the Columbia River, 75 miles from Davenport. Wilson & Glinn are the contractors. A branch from Phillipsburg to granite mines at Rumsey, Mont., 7 miles, is now nearly completed. G. W. Hunt, Portland, Or., is the contractor. A branch from near Corvallis, Mont., up Bitter Root Valley to Grantsdale, 11 miles, has also been completed. Besides these line surveys have been made between Calvin and Butte, Mont., 6 miles, and from Coeur d'Alene to Mission, Idaho, 30 miles, connecting at the latter place with the Coeur d'Alene Railway & Navigation Co.'s roads, now controlled by the Northern Pacific.

Northern Pacific & Manitoba.—Lieutenant Governor Scholz has signed the ordinance giving this company control of the Red River Valley road, and possession was taken Oct. 3. The first regular train was run Oct. 10.

The contract for grading 20 miles of the branch from Morris to Brandon has been let to Egan Bros. and G. H. Strevel.

Ohio & Northwestern.—Judge Sage of the United States District Court at Cincinnati has approved the petition of Receiver Hunt to issue Receiver's certificates to the amount of \$285,000. The certificates are wanted for purchasing rolling stock, improving the roadbed and completing the extension to Sciotoville, which has been graded.

Ohio Southern.—Right of way is being obtained at Springfield, O., for a belt road, which is to be built by this company and the Ohio, Indiana & Western.

Ohio Valley.—Chief Engineer C. C. Genung has placed surveyors in the field locating the extension from Henderson, Ky., to Evansville, Ind., a distance of 10 miles. The line will cross the Ohio River below Green River Island, near Evansville, and will, when completed, give the Louisville & Nashville a competing line in reaching the system of roads running northwest. The Central Construction Co., of Henderson, Ky., has been given the contract for the grading, and other contracts will be let shortly. The right of way has been donated the entire distance. The Ohio River will be crossed by means of transfer barges.

Old Colony.—The company has petitioned the Massachusetts railroad commissioners for a certificate of exigency for building a branch between North Attleboro and Walpole, Mass. A public hearing will be given Oct. 17.

Ore Belt.—The company has been incorporated to build a road from Cedartown, Polk County, Ga., to Cara Springs, Floyd County, Ga., a distance of 11 miles. The capital stock is \$200,000, of which \$100,000 has been subscribed by a construction company. The remaining \$100,000 has been taken by an equipment company. When built, the road will open up a rich mineral country. Grading is to be completed within 90 days. The company is asking for propositions on steel rails, engines, passenger and freight cars. Percy Lumley, Cedartown, Ga., is Chief Engineer.

Oregon Railway & Navigation Co.—The branch from the Columbia River, at Willows Creek, and southeast to Heppner, has been completed. The company has under construction lines from Farmington north to Rockford, W. T., and thence to Mullan, Idaho, 123 miles, and from Ripana, W. T., to a point on this branch between Rockford and Farmington, about 75 miles.

Philadelphia & Reading.—A preliminary injunction has been granted upon the petition of E. A. Frisbie and John H. Williams, restraining the company from making use of 2,658 shares, a controlling interest of the stock of the People's Railway, of Schuylkill County, Pa. It is alleged that the People's Company is a parallel and competing company with the Mine Hill & Schuylkill Haven road, a leased line of the Philadelphia & Reading, and therefore the Reading under the constitution cannot hold its stock.

Port Jervis, Monticello & New York.—Justice C. F. Brown, of Newburgh, N. Y., sitting in Supreme Court, Chambers, rendered a decision last week in the suit of this company against the New York, Lake Erie & Western. The complaint alleged that the Erie had instructed its station agents to refuse to receive and forward freight consigned to points on the Monticello road. Justice Brown holds that the Erie, in refusing to receive freight, as charged by the complaint, violates its obligations as a common carrier, and orders that the temporary injunction granted at the outset of the suit be continued, requiring the Erie to accept and transport freight for all points on the Monticello road until such time as the main issues of the litigation between the two companies shall have been finally adjudicated by the courts. The main issues referred to are raised in the suit for \$50,000 damages brought against the Erie for alleged violation of contract in denying the Monticello road the terminal facilities formerly enjoyed at the Port Jervis station.

Richmond & Allegheny.—A committee of the first mortgage bondholders is preparing a plan in opposition to the regular scheme of reorganization, which provides for a consolidation with the Chesapeake & Ohio. The new plan will be submitted within a few days.

Richmond, Nicholasville, Irvine & Beattyville.—The directors and stockholders of this road, which is practically an extension of the Louisville Southern, held a meeting in Louisville last week, and awarded the contract for building the entire 100 miles of the proposed road to the

Ohio Valley Improvement & Contract Co., of Louisville, Ky. The surveys will be commenced at once under Chief Engineer MacLeod, of the Louisville Southern, and the work carried on as fast as possible. An extension of the Louisville Southern, from Harrodsburg, Ky., to Richmond, Ky., will connect this road with the new one, and give a direct line through the richest part of Kentucky. When completed the new line will be operated by the Louisville Southern.

St. Louis, Baxter Springs & Oklahoma.—The preliminary surveys for this road between Galena, Baxter Springs and Coffeyville, Kan., have been completed, and it is stated that the company has made arrangements for beginning active work on the road at Baxter Springs by November.

St. Louis, Iron Mountain & Southern.—Surveyors are reported at work on a line for an extension of the Benton Branch to Hot Springs, Ark.

Savannah, Florida & Western.—The company commenced operating the Thomasville, Tallahassee & Monticello road on Oct. 8, its entire length, from Thomasville, Ga., via Metcalfe to Monticello, Fla., 24 miles.

Seaboard & Roanoke.—An extension from Cheraw to Sumter, S. C., is said to be contemplated by the company. At Sumter connection would be made with an extension of the Eutawville road, now being built to that point from Vances. By using this line and the South Carolina road from Peggalls, the Seaboard & Roanoke would secure a line into Charleston, independent of the Atlantic Coast Line.

Southern Pacific.—The company has closed a contract with the Cahaba Coal Mining Co. of Alabama, for 15 car loads of coal per day, equal to about 300 tons. This coal will be obtained from the Cahaba mines at Blount, 35 miles southwest of Birmingham. The contract is for an indefinite period of time. The coal will be used by the Atlantic Division at New Orleans and stations between that city and El Paso, Texas.

Tennessee Midland.—There are now about 2,000 hands employed on the road between Jackson and the Tennessee River, a distance of 50 miles, and it will probably be completed to that river in December. An 800-ft. tunnel will be bored through the ridge of iron ore between the Tennessee River and Centerville.

Tilton & Belmont.—At a meeting of the directors this week the contract for building the road between Tilton and Belmont, Me., six miles, was let to Ryan & Co., of New York. The contractors will begin work this week.

Ulster & Delaware.—Justice Parker has granted leave to the Attorney-General of New York to bring an action against the company to forfeit its charter because it has failed and refused to extend the line to Oneonta, N. Y., as it was stated would be done in the charter.

Union Pacific, Lincoln & Colorado.—Articles of incorporation have been filed with the Secretary of State in Colorado, with a capital stock of \$27,500,000. The road is to run from Lincoln, Neb., to Denver.

Utah Central.—The surveying party in Nevada are reported to have finished their work, and the northern party are working towards Salt Lake from Kane Springs. Three and four lines have been laid in some places.

Western New York & Pennsylvania.—In the United States Court in Pittsburgh, last week, Judge Acheson handed down an opinion in the case of Edward W. Kingsley against the Buffalo, New York & Philadelphia, on exceptions filed by the company to the Master's report on the compensation to be allowed the Receiver and his counsel. Judge Acheson sustained the claims made by the Receiver, and affirmed the Master's report. G. Clinton Gardner was President of the road before he was appointed Receiver. He was Receiver for two years, and the Master allowed him \$12,500 in addition to his salary of \$15,000. He handled during the year upwards of \$10,000,000 of funds. Samuel Dixon, Esq., of Philadelphia, and George Zabriskie, of New York, each receive \$7,500.

West Penn & Shenango Connecting.—The appeal of W. W. Reed, of New York, in the case of the Fidelity Insurance Trust & Safe Deposit Co., Trustee, against the company from the decree of the Common Pleas Court of Mercer County, Pa., was argued this week in the Supreme Court, at Pittsburgh. Reed was the contractor for building the road, for which work he was to receive, in addition to cash, a large proportion of the stock of the road. He completed it, and when it was finished, agreed, it is claimed, to the issuing of a first mortgage to the Fidelity Co. for \$400,000. The company became insolvent later, and Reed put in a priority claim for work. The lower court decided that the mortgage had the first claim, in that Reed, as a member of the company, agreed to its issuance. The decision was reserved.

Western Union Telegraph.—The annual report for the year ended June 30 shows the net earnings to be \$496,364 in excess of the 4½ per cent. dividends paid to stockholders during the year, or a little over ½ per cent., showing earnings equal to 5½ per cent. on the stock. The gross earnings increased \$2,519,254 over those of the preceding year; the expenditures increased \$1,485,924, and the net earnings \$1,033,330. The tabular results follow:

	1886.	1887.	1888.
Gross earnings.....	\$16,298,639	\$17,191,910	\$19,711,164
Expenses.....	12,378,784	13,154,629	14,640,592
Net earnings.....	\$3,919,855	\$4,037,281	\$5,070,572
Int. and sinking fund.....	534,453	530,065	530,258
Balances.....	\$3,385,402	\$3,507,216	\$4,540,314
Dividends paid.....	c 3,399,573	d 811,864	e 4,043,950
Surplus for the year.....		\$2,695,352	\$496,364
Deficit for the year.....	\$14,171		
c dividend, 4¼ per cent.; d dividend, 1 per cent.; e dividend, 4½ per cent.			

	1886.	1887.	1888.
Miles of poles and cable.....	151,832	156,814	171,375
Miles of wire.....	489,607	524,641	616,248
Number of offices.....	15,142	15,658	17,241
Number of messages.....	43,289,807	47,294,530	51,463,955

TRAFFIC AND EARNINGS.

The Inter-state Commerce Commission.

The Commission has decided in a case brought against the Burlington & Missouri River road, concerning a trip pass which was issued in alleged violation of the second section of the act to regulate commerce, that the complainant has no case. The trip pass was issued on April 10, 187, to C. H. Waite, an employé who had been discharged and who wished to go to Atchison to seek employment on another road. The pass was never used and expired in 20 days. The commission decides that unlawfulness under this section consists in the doing of a service by a carrier in the manner forbidden by the statute. The pass not being used it is ruled

that no service was performed. The motive for bringing the complaint does not appear in the accounts published.

In the case of the Spartanburg Board of Trade against the Richmond & Danville, a motion had been made to dismiss the complaint; the board was asked to pass upon the relative reasonableness of rates at many stations and in a large extent of territory upon the mere face of certain tariffs; the parties are required to present further evidence.

The Western Freight Association, at a meeting in Chicago, on Tuesday, considered the question of a uniform classification, in pursuance of the recommendation of Chairman Cooley, of the Interstate Commerce Commission, in his recent letter to Mr. Blanchard. The Association recommends the appointment of a committee of three by each of the six principal traffic associations in the country to meet for the consideration of the question.

Traffic Notes.

Receiver Truesdale, of the Minneapolis & St. Louis, has complained to Chairman Abbott that the Wisconsin Central takes second-class passengers between Minneapolis and Chicago at \$1 less than the agreed rate.

The Iowa Railroad Commissioners are taking testimony on the complaint of the Dubuque Jobbers and Manufacturers' Association against the Illinois Central, Chicago, Milwaukee & St. Paul and Chicago, St. Paul & Kansas City, alleging that illegal high rates are charged on freight.

The Louisville & Nashville, is now out of both the Southern Railway & Steamship Association and the Southern Passenger Association. The Cincinnati, New Orleans & Texas Pacific is out of the Passenger Association, but is still in the Southern Railway & Steamship Association.

A Denver dispatch states that the Burlington & Missouri River has reduced fares to Missouri River points one-third. The action is based on alleged irregularities of competing lines in making special rates for parties.

The Southern Pacific has placed in its principal ticket offices in Oregon tickets to all Eastern points, via the Central Pacific. This is a bid for travel to the East which has heretofore gone over the Oregon Short Line and the Northern Pacific. Regular unlimited rates are \$15 above the San Francisco rate, but limited first and second class tickets are sold at the same price as from San Francisco.

A new fast mail train has been put on between New York and St. Louis over the Pennsylvania. It will leave New York at 7:40 p. m., and arrive at the principal western termini in about one hour quicker time than was made by previous mail trains. The east-bound train will leave St. Louis at 10 a. m., and arrive in New York the next day at 4 p. m.

St. Louis Passenger Rates.

There is a truce in the war among the lines out of St. Louis on eastbound passenger business, and all rates were restored to the old figures on Wednesday. The general passenger agents of the Vandalia, Bee Line, Wabash and Ohio & Mississippi held a meeting in Cleveland Tuesday, and decided to advance rates for thirty days pending a final settlement of the points at issue. The new rates are as follows: From St. Louis to New York, Vandalia, \$23; Bee Line, \$22; Wabash, \$21; Ohio & Mississippi, \$20. The Bee Line thus partially secures the differential it was fighting to maintain. With the exception of the Vandalia, which is 50 cents less, the rates are the same as before the cutting began. A meeting of passenger agents of the roads interested will be held in Chicago next Tuesday to arrange minor details. Within thirty days there will be another meeting, at which exhibits of the business done by the four roads during the past six months will be presented and new differentials agreed upon. This restoration is made without a ten days' notice, and is apparently a violation of the Interstate Commerce law.

East-bound Rates.

The official announcement of the restored rates which go into effect Oct. 15, provides for the following rates, Chicago to New York: 75c., 65c., 50c., 35c., 30c., 25c. Grain, flour, etc., in carloads, 30c.; cured meats, lard, etc., L. C. L., 30c.; provisions in carloads, 25c.; bulk meats, carloads, 30c.; butter, 50c.; wool, 75c.; in machine compressed bales, 55c.; tobacco, 30c.; pig iron, C. L., 20c.; live hogs, C. L., 25c. This rate on hogs applies to Boston also.

Live Stock Shipments.

The following comparative statement of shipments of live stock from Kansas City for the month of September by the principal roads is taken from a local paper:

	Cars.
C. R. I. & P.	59
Wabash Western	132
Chi. St. Paul & K. C.	352
C. B. & Q.	745
Chi. Santa Fe & Cal.	1,138
Chicago & Alton	1,538

Receipts of live stock at Chicago by the leading lines for September, in cars:

	Cars.
Chicago & Alton	2,403
Chicago, Burlington & Quincy	3,743
Chi. St. Paul & K. C.	2,099
Chi. & N. W.	3,413
C. R. I. & P.	1,441
Chi. Santa Fe & Cal.	1,479
Illinois Central	710
Wabash	760

Cotton.

The cotton movement for the week ending Oct. 5 is reported as follows, in bales:

	1888.	1887.	Decrease.	P. c.
Receipts	133,019	163,208	30,279	18.5
Shipments	93,283	134,260	37,977	26.8
Stock	98,210	147,999	49,789	33.6

Exports:

Receipts	190,568	251,186	60,618	24.1
Exports	81,748	170,439	88,691	52.0
Stock	327,648	425,896	95,248	23.1

East-bound Shipments.

The shipments of east-bound freight from Chicago by all lines for the week ending Saturday, Oct. 6, amounted to 59,105 tons, against 59,298 tons during the preceding week, a decrease of 193 tons, and against 36,058 tons during the corresponding week of 1887, an increase of 23,047 tons. The proportions were:

	P. c.
Wabash	9.3
Michigan Central	9.4
Lake Shore & Michigan Southern	13.8
Pitts., Fort Wayne & Chic.	14.6
Chicago, St. L. & Pitts.	12.9
Baltimore & Ohio	5.1
Chicago & Grand Trunk	15.5
N. Y., Chicago & St. Louis	9.1
Chicago & Atlantic	10.3
Total	100.0

Of the above shipments 3,279 tons were flour, 24,593 tons grain, 3,540 tons cured meats, 1,842 tons lard, 8,492 tons dressed meats, 1,098 tons butter, 1,375 tons hides, 262 tons wool, and 3,176 tons lumber. The Chicago & Grand Trunk carried the greatest share of the shipments. The three Van-

derbilt lines together carried 32.3 per cent. of all the business, while the two Pennsylvania lines carried 27.5 per cent.

Coal.

The coal and coke tonnage of the Pennsylvania originating on lines east of Pittsburgh and Erie for the week ending Sept. 29, and the year to that date, was as follows:

	Coal.	Coke.	Total.
Total for week ending Sept. 29.	227,978	93,371	321,349
Total for year 1888 to date.	8,655,881	2,919,554	11,575,435
Total for year 1887 to date.	7,621,268	2,606,294	10,227,562

The anthracite coal tonnage of the Belvidere division of the United Railroads of New Jersey division for the same periods was as follows:

	1888.	1887.	Inc.
Total for week ending Oct. 6.	42,424	12,548	29,876
Total for year.	1,215,539	1,191,134	24,404

The coal tonnages for the week ending Oct. 6 are reported as follows, in tons:

	1888.	1887.	Increase.	P. c.
Anthracite	8,636	724,374	104,262	14.4
Bituminous	339,397	313,917	25,470	8.1

Railroad Earnings.

The earnings and expenses of the Central Pacific for July, and from Jan. 1 to July 31, were as follows. The mileage is 1,861 against 1,408 last year:

	1888.	1887.	Inc.	P. c.
Gross earnings	\$1,385,438	\$1,229,537	\$155,901	12.7
Op. expenses	765,124	589,210	175,914	29.9
Net earnings	\$620,314	\$640,324	\$3,450,304	3,284,257
Rental leased lines			6,262	
Net increase	620,314		\$1,465,566	
Fixed char.	404,383		2,956,822	
Net profit	\$215,931		\$508,744	

* Includes interest, rentals, additions and betterments, taxes, and U. S. dues.

The following statement shows the earnings of the Chicago, Burlington & Quincy for August and since Jan. 1:

	1888.	1887.	Decrease.
Gross	\$2,273,702	\$2,382,102	\$108,400
Net	681,889	957,405	275,516
Jan. 1 to Aug. 31:			
Gross	\$14,113,168	\$17,826,009	\$3,712,841
Net	2,328,626	7,922,858	5,594,231

The following are the earnings of the Union Pacific for August and the eight months to September 30:

August:		Inc. or Dec.
Gross earnings.....	\$2,587,355	I. \$50,757
Operating expenses.....	1,512,896	I. 191,049
Net.....	\$1,074,459	D. \$141,192
Jan. 1 to Sept. 1:		
Gross earnings.....	\$18,625,000	I. 587,137
Operating expenses.....	11,553,159	I. 581,600
Net.....	\$7,071,841	I. \$5,537

The earnings and expenses of the Louisville & Nashville for August and the two months to Aug. 31 were as follows:

	1888.	1887.	Inc. or Dec.
Gross earnings	\$1,345,927	\$1,369,561	D. \$23,634
Op. expenses	858,011	817,097	I. 40,914
Net earnings	\$487,916	\$552,464	D. \$64,548
July to Aug. 31:			
Gross earnings	\$2,679,359	\$2,696,224	D. \$16,865
Op. expenses	1,711,844	1,601,454	I. 110,390
Net	\$967,515	\$1,094,770	D. \$128,255

The following are the earnings in Mexican currency of the Mexican National for August and July:

	1888.	1887.
Approx. gross earnings Aug., excluding construction material	\$141,435	\$137,215
Actual gross earnings, July	141,742	116,616
Construction	30,011	437
Total	\$171,753	\$117,353
Expenses	173,542	125,025
Net deficit	\$1,789	\$7,672

The earnings and expenses of the Chicago, Burlington & Quincy for the month of August and the eight months to Aug. 31 were as follows:

	1888.	1887.	Inc. or Dec.
Passenger	\$552,122	\$627,505	D. \$75,383
Freight	1,538,528	1,563,632	D. 25,104
Mail and mis.	183,052	190,946	D. 7,894
Total	\$2,273,702	\$2,382,103	D. \$108,401
Expenses	1,591,813	1,424,697	I. 167,116
Net earnings	\$681,889	\$957,406	D. \$275,517
Jan. 1 to Aug. 31:			
Passenger	\$3,787,882	\$4,151,331	D. \$363,449
Freight	8,950,297	12,235,318	D. 3,285,021
Mail and mis.	1,374,989	1,439,361	D. 64,372
Total	\$14,113,168	\$17,826,010	D. \$3,712,841
Expenses	11,784,542	9,903,151	I. 1,881,390
Net earnings	\$2,328,626	\$7,922,859	D. \$5,594,231

The statement of the New York, Lake Erie & Western for August, and for the eleven months ending Aug. 31, is as follows:

	1888.	1887.	Inc. or Dec.
Gross earnings	\$2,411,837	\$2,440,766	D. \$28,929
Op. expenses	1,568,907	1,540,960	I. 27,946
Due leased lines	\$842,924	\$899,806	D. \$56,875
Net earnings	\$218,754	\$218,754	I. 12,402
Oct. 1 to Aug. 31:			
Gross earnings	\$24,128,941	\$24,839,199	I. 710,258
Op. expenses	15,559,563	16,142,134	I. 582,570
Due leased lines	\$8,568,778	\$8,697,066	I. \$128,288
Net earnings	\$2,101,641	\$2,183,830	I. 82,188
Net earnings	\$6,467,237	\$6,513,267	I. \$46,030

The earnings of the Cairo, Vincennes & Chicago for August are as given below:

	1888.	1887.	Inc. or Dec.
Gross earnings	\$75,558	\$78,372	I. \$2,814
Op. ex. and taxes	44,250	41,176	I. 3,074
Net earnings	\$31,308	\$37,196	D. \$5,888

The statement of the Central of Georgia for August shows:

	1888.	1887.	Inc. or Dec.
Earnings	\$528,782	\$466,182	I. \$62,600
Expenses	341,652	330,097	I. 11,554
Net earnings	\$187,130	\$136,084	I. \$51,045
Other income	4,512	17,230	D. 12,707
Surplus	\$192,642	\$153,304	I. \$38,701

Earnings of railroad lines for various periods are reported as follows:

	1888.	1887.	Inc. or Dec.	P. c.
Month of September:				
Cairo, Vin. & Chi.	\$53,838	\$55,837	I.	2.00
Mid. & Northern	90,300	90,000	I.	0.33
Tol. A. A. & N. M.	65,407	55,784	I.	17.3
Lake E. & West.	224,480	211,315	I.	6.2
Buff. R. & Pitts.	151,153	220,501	D.	31.4

Month of August:

	1888.	1887.	Inc. or Dec.	P. c.
Allegheny Valley	185,713	192,725	D.	7.012
Net	83,483	83,483	D.	0.000
Cam. & Atl. & Br.	148,368	149,909	D.	2.821
Net	79,368	85,171	D.	5.803
Cairo, V. & Chic.	75,758	78,322	D.	2.564
Net	35,508	37,146	D.	5.638
Canadian Pac.	1,218,737	1,055,170	I.	163,567
Net	419,328	386,411	I.	32,917
Cent. of Georgia	528,782	466,182	I.	62,600
Net	187,130	136,084	I.	51,045
Central of N. J.	1,363,315	1,187,827	I.	175,488
Net	629,714	604,986	I.	24,728
Chic. B. & Q.	2,278,702	2,382,103	D.	103,401
Net	681,889	957,406	D.	275,517
Cin. N. O. & T. P.	312,864	273,691	I.	39,173
Net	104,000	94,000	I.	10,000
N. O. & N. E.	59,366	44,785	I.	14,581
Net	34,373	37,567	D.	3,194
Vicks. & Mer.	3,000	1,000	I.	2,000
Vicks. Sh. & Pac.	45,954	39,512	I.	6,442
Net	13,000	5,000	I.	8,000
Den. & R. G. W.	116,815	118,218	D.	1,403
Net	26,726	27,489	D.	763
Flint & P. M.	119,227	216,477	D.	97,250
Net	84,748	65,273	I.	19,475
Louisv. & Nashv.	1,345,927	1,369,561	D.	23,634
Net	487,916	532,464	D.	44,548
L. N. O. & Tex.	156,929	134,174	I.	22,755
Net	24,519	30,806	D.	6,287
N. Y. Ont. & W.	191,722	178,171	I.	13,551
Net	57,523	56,851	I.	672
Northern Pacific	1,965,291	1,290,586	I.	674,705
Net	639,484	601,006	I.	38,478
Ohio & Miss.	379,185	409,911	D.	30,726
Net	146,353	184,981	D.	38,628
Pitts. & Western	198,340	192,231	I.	6,109
Net	59,210	59,178	I.	32
Tol. & Ohio Cen.	102,249	95,306	I.	6,943
Net	23,777	25,247	D.	1,470
Union Pacific	2,587,355	2,586,598	I.	756
Net	1,074,459	1,215,651	D.	141,192
W. N. Y. & Pa.	341,188	290,012	I.	51,176
Net	129,987	99,159	I.	30,828
West J. & Brs.	243,738	231,060	I.	12,678
Net	108,184	111,185	D.	3,001

Nine months—Jan. 1 to Sept. 30:

	1888.	1887.	Inc. or Dec.
N. Y., L. E. & W.	\$1,560,024	\$1,549,519	I.
Mid. & North.	782,886	689,106	I.
Tol. A. A. & N. M.	476,551	381,163	I.

Eight months—Jan. 1 to Aug. 31:

Allegheny valley	\$1,327,664	\$1,302,592	I.	\$25,072	1.9
Net	527,610	482,888	I.	44,722	9.3
Cam. & Atl. & Brs.	507,242	510,272	D.	3,030	6
Net	123,296	146,677	D.	23,381	15.9
Canadian Pac.	8,240,483	6,841,262	I.	1,399,221	20.5
Net	1,934,227	1,718,935	I.	215,292	12.5
Gen. of Georgia.	4,248,721	3,597,279	I.	651,442	18.1
Net	1,392,744	932,845	I.	459,899	24.6
Central of N. J.	8,381,613	7,518,718	I.	862,895	11.5
Net	3,383,323	3,111,623	I.	271,699	8.3
Chi. Bur. & Q.	13,113,168	12,316,011	D.	3,711,843	29.8
Net	2,328,626	7,927,850	D.	5,594,223	60.8
Cin., N. O. & Tex.					
Pac.	2,353,469	2,116,879	I.	236,590	11.3
Net	687,000	754,006	D.	57,000	8.0
N. O. & N. E.	531,698	495,917	I.	125,781	31.0
Net	46,000	36,000	I.	10,000	27.0
Vicks. & Mer.	286,959	312,315	D.	25,356	8.4
Net	30,000	8,000	I.	12,000	150.0
V. Shre. & B.	317,776	310,946	I.	6,830	2.2
Net	48,000	32,000	I.	16,000	50.0
Den. & R. G. W.	828,022	700,801	I.	127,221	18.3
Net	178,257	178,023	I.	234	0.1
Flint & Pere. Mar.	1,618,277	1,704,355	D.	86,078	5.0
Net	490,869	549,272	D.	58,403	10.6
Louv. & Nash.	10,436,510	10,113,422	I.	323,088	3.0
Net	3,336,340	3,834,394	D.	498,054	14.9
L. N. O. & Tex.	1,432,040	1,170,232	I.	261,798	22.4
Net	319,117	276,219	I.	42,898	15.5
N. Y., O. & West.	1,123,248	993,712	I.	129,535	12.5
Net	165,515	164,765	I.	750	0.5
Northern Pacific	10,708,858	7,949,315	I.	2,758,723	34.7
Net	3,984,813	3,062,930	I.	922,483	30.1
Ohio & Miss.	2,365,394	2,622,927	D.	228,633	8.7
Net	621,773	897,587	D.	275,814	20.7
Pitt. & West.	125,695	129,959	I.	4,026	3.0
Net	304,744				
Tol. & Ohio Cent.	746,228	616,230	I.	99,998	15.5
Net	207,345	194,267	I.	13,078	6.0
Union Pacific	18,625,000	18,037,803	I.	587,197	3.0
Net	7,071,841	7,066,304	I.	5,537	0.1
W. N. Y. & Pa.	2,829,303	1,777,116	I.	252,201	14.3
Net	584,764	333,720	I.	251,044	75.0
West J. & Brs	1,100,615	1,631,544	I.	69,967	6.0
Net	422,359	4,055,718	I.	16,364	4.7
Total (gross)....	\$91,349,726	\$87,493,726	I.	\$3,846,021	4.2
Total (net).....	28,345,737	32,463,751	D.	4,123,014	12.4